

FINAL

**RECORD OF DECISION
OPERABLE UNIT NO. 17
(SITES 90, 91 AND 92)**

**MARINE CORPS BASE
CAMP LEJEUNE, NORTH CAROLINA**

CONTRACT TASK ORDER 0344

AUGUST 2001

Prepared for:

**DEPARTMENT OF THE NAVY
ATLANTIC DIVISION
NAVAL FACILITIES
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LIST OF ACRONYMS AND ABBREVIATIONS

| | |
|---------|---|
| AOC | area of concern |
| ARAR | applicable or relevant and appropriate requirements |
| AST | aboveground storage tank |
| Baker | Baker Environmental, Inc. |
| bgs | below ground surface |
| BTEX | benzene, toluene, ethylbenzene, total xylene |
| Catlin | Richard Catlin & Associates, Inc. |
| CERCLA | Comprehensive Environmental Response, Compensation, and Liability Act |
| CFR | Code of Federal Regulations |
| CLEAN | Comprehensive Long-Term Environmental Action Navy |
| COPCs | contaminants of potential concern |
| CSA | Comprehensive Site Assessment |
| DDD | dichlorodiphenyldichloroethane |
| DDE | dichlorodiphenyldichloroethylene |
| DDT | dichlorodiphenyltrichloroethane |
| DoN | Department of the Navy |
| FFA | Federal Facilities Agreement |
| ft/ft | feet/foot |
| gpm | gallons per minute |
| GRO | gasoline range organics |
| GTGS | Groundwater Technology Government Services, Inc. |
| IDW | investigative derived waste |
| IRP | Installation Restoration Program |
| LANTDIV | Naval Facilities Engineering Command, Atlantic Division |
| MCAS | Marine Corps Air Station |
| MCB | Marine Corps Base |
| MCL | Maximum Contaminant Level |
| Msl | mean sea level |
| MTBE | methyl tertiary butyl ether |
| mg/kg | milligrams per kilogram |
| µg/kg | micrograms per kilogram |
| µg/L | micrograms per liter |
| NCP | National Oil and Hazardous Substances Pollution Contingency Plan |
| NC DENR | North Carolina Department of Environment and Natural Resources |
| NCWQS | North Carolina Water Quality Standard |
| NPL | National Priorities List |
| OU | Operable Unit |

LIST OF ACRONYMS AND ABBREVIATIONS
(Continued)

| | |
|-------|---|
| PAHs | polynuclear aromatic hydrocarbons |
| PCBs | polychlorinated biphenyls |
| PCE | tetrachloroethene |
| PRAP | Proposed Remedial Action Plan |
| PVC | polyvinyl chloride |
| QA/QC | quality assurance/quality control |
| RAB | Restoration Advisory Board |
| RAGS | Risk Assessment Guidance for Superfund |
| RBC | Risk-Based Concentrations |
| RCRA | Resource Conservation and Recovery Act |
| RFG | Reformulated Gasoline |
| RI | Remedial Investigation |
| ROD | Record of Decision |
| SARA | Superfund Amendments and Reauthorization Act |
| SSL | soil screening level |
| SVOCs | semivolatile organic compounds |
| TBC | to-be-considered |
| TCE | trichloroethene |
| TCLP | Toxicity Characteristic Leaching Procedure |
| TPH | total petroleum hydrocarbon |
| USGS | United States Geological Survey |
| UST | underground storage tank |
| USEPA | United States Environmental Protection Agency |
| VOC | volatile organic compound |

DECLARATION

Site Names and Locations

Operable Unit Number (No.) 17
Site 90 (Building BB-9)
Site 91 (Building BB-51)
Site 92 UST (BB-46)
Marine Corps Base (MCB)
Camp Lejeune, North Carolina

Statement of Basis and Purpose

This decision document presents the selected remedy for Operable Unit (OU) No. 17 (Sites 90, 91, and 92), which are located at MCB, Camp Lejeune, North Carolina. The selected remedy for all three of the sites that comprise OU No. 17 was chosen in accordance with the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) of 1980, as amended by the Superfund Amendments and Reauthorization Act (SARA), and to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). This decision document is based on the Administrative Record for OU No. 17.

Assessment of the Site

The lead agency has determined that No Action is appropriate at OU No. 17 (Sites 90, 91, and 92) to protect public health, welfare, and the environment from actual or threatened releases of pollutants to the environment.

Description of the Selected Remedy

The selected remedial alternative for OU No. 17, including Sites 90, 91, and 92, is No Action. This remedial alternative involves taking no remedial actions. The environmental media will be left as they currently exist at all three sites. Further actions are not required for these sites because constituents are at levels that will allow for unlimited use and unrestricted exposure to site media.

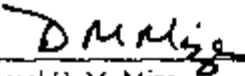
Statutory Determinations

The United States Environmental Protection Agency (USEPA) believes that the No Action decision is justifiable, as the conditions at OU No. 17 are protective of human health and the environment. The North Carolina Department of Environment and Natural Resources (NC DENR) has reviewed and concurs with the No Action decision. There are no applicable or relevant and appropriate requirements (ARAR) waivers, costs, or treatment technologies associated with these sites because a No Action decision has been determined appropriate for this OU.


Data Certification Checklist

The following information is included in the Decision Summary sections of this Record of Decision (ROD). Additional information can be found in the Administrative Record file for this OU.

- Chemicals of potential concern and their respective concentrations from the environmental investigations conducted at the sites are discussed starting on pages 4, 18, and 30 for Sites 90, 91, and 92, respectively.
- The qualitative risk assessments conducted for Sites 90, 91, and 92 are discussed on pages 8, 22, and 32, respectively.
- Clean up levels were not established for these sites because no remedial actions are required.
- There are no source materials constituting a threat at these sites. The environmental media at these sites will be left as they currently exist at each site.
- A baseline risk assessment was not conducted for these sites so no assumptions about current and future land or groundwater uses were made for exposure scenario risk calculations.
- No restrictions apply to land or groundwater uses at these sites.
- No Action at these sites requires no capital costs or annual operation and maintenance costs. No Action will be effective upon approval of this ROD.
- The No Action decision for Sites 90, 91, and 92 was evaluated using nine criteria on pages x and xi.


 Major General D. M. Mize
 Commanding General
 Marine Corps Base, Camp Lejeune

25 SEP 2001
 Date


 Richard D. Green, Director
 Waste Management Division
 U.S. Environmental Protection Agency - Region 4

9/28/01
 Date


 Dexter Matthews, Interim Director
 Division of Solid Waste Management
 North Carolina Department of Environment and Natural Resources

9-26-01
 Date

DECISION SUMMARY - OU NO.17

Marine Corps Base (MCB), Camp Lejeune was placed on the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980 National Priorities List (NPL) effective November 4, 1989 (54 Federal Register 41050, October 4, 1989). Subsequent to this listing, the United States Environmental Protection Agency (USEPA) Region IV, the North Carolina Department of Environment and Natural Resources (NC DENR), the United States Department of the Navy (DoN) and the Marine Corps entered into a Federal Facilities Agreement (FFA) for MCB, Camp Lejeune in 1991. The primary purpose of the FFA was to ensure that environmental impacts associated with past and present activities at MCB, Camp Lejeune are thoroughly investigated, and that appropriate CERCLA responses and Resource Conservation Recovery Act (RCRA) corrective action alternatives are developed and implemented as necessary to protect public health and welfare, and the environmental (MCB, Camp Lejeune Federal Facilities Agreement, 1989).

MCB, Camp Lejeune is located on the coastal plain of North Carolina in Onslow County. The facility is bisected by the New River and encompasses approximately 236 square miles (of which approximately 40 square miles is water, made up by the New River and its tributaries). The New River flows in a southeasterly direction and forms a large estuary before entering the Atlantic Ocean. The southeastern border of MCB, Camp Lejeune is the Atlantic Ocean shoreline. The western and northeastern boundaries of the facility are U.S. Route 17 and State Route 24, respectively. The city of Jacksonville borders MCB, Camp Lejeune to the north.

Construction of MCB, Camp Lejeune began in April 1941 at the Hadnot Point Industrial Area, where major functions of the base are centered today. The facility was designed to be the "World's Most Complete Amphibious Training Base." The MCB, Camp Lejeune complex consists of six geographical and operational locations under the jurisdiction of the Base Command. These areas include Camp Geiger, Montford Point (which includes Camp Johnson), Courthouse Bay, Mainside, the Rifle Range Area and the Greater Sandy Run Area. Marine Corps Air Station (MCAS) New River is operationally under the control of MCAS Cherry Point. However, MCB, Camp Lejeune is responsible for the facilities and environmental management of MCAS New River.

Operable Unit (OU) No. 17 is one of 22 OUs located within MCB, Camp Lejeune. In the case of OU No. 17, Sites 90, 91, and 92 were grouped together because of their similar history (underground storage tank [UST] sites), contaminants (chlorinated hydrocarbons) and general location (Courthouse Bay area). Figure 1 depicts the locations of OU No. 17 and Sites 90, 91, and 92. As shown, OU No. 17 is located within the southern portion of the Base.

The overall selected remedial action for OU No. 17 is No Action. The Decision Summary for each individual site included in this OU are presented separately in the following sections of this document. It should be noted that no enforcement activities have been conducted or required for this OU. With the signing of this Record of Decision (ROD), CERCLA requirements for this OU will be satisfied. However, because of rule changes in the North Carolina UST program, these three sites will be re-evaluated for closure as UST sites.

No Action was the only action considered for these sites because the extent and level of impacted media was not great enough to warrant remedial action. Because there are no alternatives to compare to the No Action decision, this decision will be directly compared to the nine criteria. The nine criteria are described on Table 1. The No Action decision meets each criteria discussed below.

- Overall Protection of Human Health and the Environment: The No Action alternative is protective of human health and the environment because site-related constituent concentrations are below, or only slightly exceeding screening requirements considered protective for residential land use. In addition, the exceedances are not prevalent and do not impact a large area of the sites.
- Compliance with ARARs/TBCs: North Carolina Water Quality Standards (NCWQS) are applicable or relevant and appropriate requirements (ARARs) for groundwater. One site related compound (trichloroethene [TCE]) exceeded the NCWQS but is limited to a small area at Site 90. Risk-based concentrations (RBCs) for soil and groundwater, and soil screening levels (SSLs) for soil are criteria to-be-considered (TBC). One site-related compound (TCE) exceeded the RBC for groundwater at Site 90 in the same small area of NCWQS exceedance.
- Long-Term Effectiveness and Permanence: Because of the very low concentrations of site-related compounds, No Action will be protective of human health and the environment at the present time and the future.
- Reduction of Toxicity, Mobility, or Volume Through Treatment: No treatment is required at the sites to protect human health and the environment.
- Short-Term Effectiveness: The No Action decision is protective of human health and the environment in the short-term because there are no immediate adverse impacts.
- Implementability: No Action is easily implemented.
- Cost: No costs will be incurred with the implementation of this alternative.

TABLE 1

GLOSSARY OF EVALUATION CRITERIA
OPERABLE UNIT NO. 17
MCB CAMP LEJEUNE, NORTH CAROLINA
RECORD OF DECISION CTO -0344

- **Overall Protection of Human Health and the Environment** - addresses whether or not an alternative provides adequate protection and describes how risks posed through each pathway are eliminated, reduced, or controlled through treatment engineering or institutional controls
- **Compliance with ARARs/TBCs** - addresses whether or not an alternative will meet the applicable or relevant and appropriate requirements (ARARs), criteria to-be-considered (TBCs), and other federal and state environmental statutes, and/or provide grounds for invoking a waiver.
- **Long-Term Effectiveness and Permanence** - refers to the magnitude of residual risk and the ability of an alternative to maintain reliable protection of human health and the environment over time once cleanup goals have been met.
- **Reduction of Toxicity, Mobility, or Volume Through Treatment** - refers to the anticipated performance of the treatment options that may be employed within an alternative.
- **Short-Term Effectiveness** - refers to the speed with which the alternative achieves protection, as well as the remedy's potential to create adverse impacts on human health and the environment that may occur during the construction and implementation period.
- **Implementability** - refers to the technical and administrative feasibility of an alternative, including the availability of materials and services required to implement the chosen solution.
- **Cost** - includes capital and operation and maintenance costs. For comparative purposes, present worth values are provided.

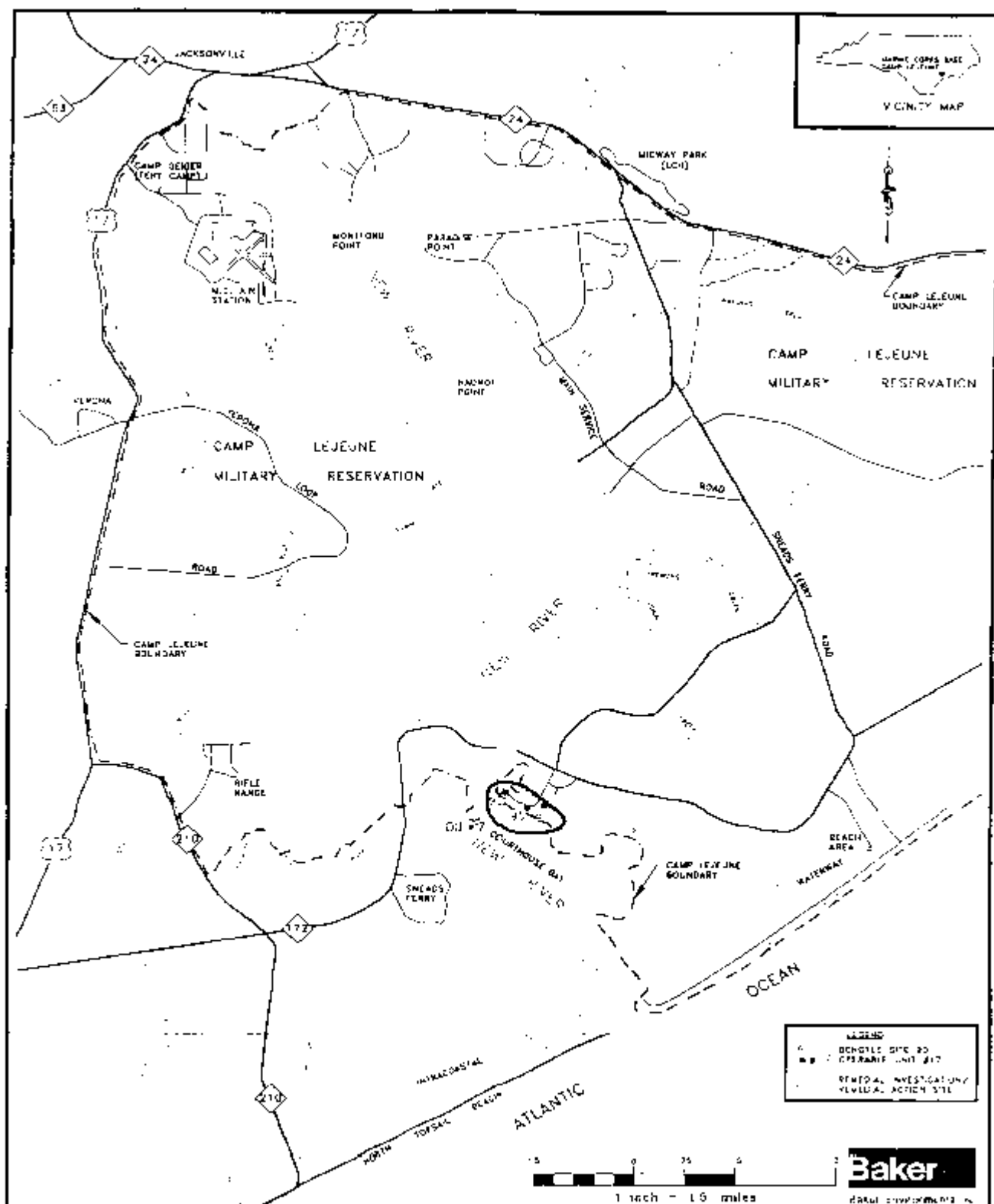


FIGURE 1
OPERABLE UNIT No. 17
RECORD OF DECISION
CFO - 0344

MARINE CORPS BASE, CAMP LEJEUNE
NORTH CAROLINA

1.0 DECISION SUMMARY - SITE 90

1.1 Site Name, Location and Description

Site 90 (Building BB-9) is located in the Courthouse Bay Area of MCB, Camp Lejeune and is one of three sites that comprise OU No. 17. Sites 91 and 92 are discussed individually following Site 90's Decision Summary, and are the other two sites included under OU No. 17. The previous investigations at Site 90 focused on a former UST basin where three 1,000-gallon steel USTs, containing heating oil, were previously located. The former UST basin is located on the east side of Peach Street, between Building BB-16 (a dry cleaning distribution facility and chapel) and Building BB-9 (a heating plant) (See Figure 90-1).

The study area associated with Site 90 is approximately six acres, and is located along Peach Street, between, Clinton and Middle Streets. Facilities located within the limits of the study area include an administrative office (BB-5), commissary (BB-245), restaurant (BB-245), chapel (BB-16), dry cleaning and shoe repair distribution center (BB-16), fire station (BB-8), gymnasium (BB-2), and heat plant (BB-9). During the Focused Remedial Investigation (RI), consideration was given to structures associated with the heat plant that may be potential sources, include three aboveground storage tanks (ASTs) that store diesel fuel # 2, an oil-water separator for treating storm water runoff from the AST pad, a fuel unloading area, and three tanks containing anti-corrosive materials located on the north side of Building BB-9. Open areas located in the study area are either parking lots, roadways, or maintained areas covered with grass.

The nearest surface water body is a small unnamed creek that is located approximately 400 feet directly north of the former UST basin. A storm drainage ditch that channels storm runoff into the unnamed creek from the vicinity of Building BB-9, Building BB-16, and instructional facilities located immediately to the east of the investigation area is located approximately 150 feet to the east of the former UST basin. Bar ditches are located along Peach and Clinton Streets that also drain into the unnamed creek. The largest surface water body located in the vicinity of Site 90 is the New River, which is located approximately 800 feet southwest of the site.

1.2 Site History and Enforcement Activities

No enforcement activities have been conducted or are required at this site.

Originally, three 1,000-gallon steel USTs that stored heating oil were adjacent to Building BB-9. All three tanks were excavated and permanently closed in March 1993. Soil contamination was noted during the tank removal activities; however, there was no information on the analysis of soil or groundwater contamination to confirm or estimate the extent of the impact (Catlin, 1994). The former tank basin currently remains unpaved.

The existing dry cleaning/cobbler shop facility located in Building BB-16 is a distribution center only. Dry-cleaning processes were performed at this location for an unknown period of time and has been discontinued. During the years that dry cleaning operations were conducted at this location, there was a 250-gallon AST at Building BB-16 which reportedly contained dry cleaning fluid (Catlin, 1994).

Although enforcement activities at Site 90 do not include soil or groundwater remedial actions, various investigations have been conducted. These investigations include the Focused RI conducted

by Baker Environmental, Inc. (Baker) in 1997; a three well site check that was conducted in April 1993 by Groundwater Technology Government Services, Inc. (GTGS); and a comprehensive site assessment according to Section 280.65 of 40 Code of Federal Regulations (CFR) Part 280, Federal Technical Standards for USTs and Section .0706 of the North Carolina Administration Code Title 15A, Chapter 2, Subchapter 2N, North Carolina Criteria and Standards applicable to USTs. The Leaking Underground Storage Tank Comprehensive Site Assessment (CSA), Building BB-9, was conducted in December 1994 by Richard Catlin & Associates, Inc. (Catlin). Site 90 was placed in the Installation Restoration Program (IRP) because contaminants not associated with the former UST basin were detected during the CSA. The Focused RI was conducted under the IRP. Post-RI studies were also conducted, including the Supplemental Groundwater Investigation and the Temporary Well Delineation Study. The results of these studies are summarized in the Site Characteristics section of this document.

At the conclusion of this CERCLA decision, this site will be re-evaluated under the North Carolina UST program due to rule changes in the UST program.

1.3 Highlights of Community Participation

The Final Proposed Remedial Action Plan (PRAP) for OU No. 17 at MCB Camp Lejeune, North Carolina was released to the public on July 11, 2001. This document was made available to the public at the information repositories maintained at the Onslow County Public Library and the MCB Camp Lejeune Library.

A public comment period regarding OU No. 17 was held from July 11, 2001 through August 10, 2001; and a public meeting was held on July 18, 2001. An advertisement for public meeting was published in the Jacksonville Daily News on July 18, 2001. During this public meeting, representatives from the DoN and the Marine Corps discussed the preferred remedial action under consideration. Community concerns were also addressed during the public meeting.

Community comments regarding the preferred remedial action, and the response to the comments received during the noted comment period are included in the Responsiveness Summary section of this ROD.

1.4 Scope and Role of OU No. 17 (Site 90)

No Action is the selected remedial action for OU No. 17, Site 90. The No Action decision is the final recommended action for OU No. 17, Site 90. This decision is based on the findings of the Focused RI field investigation and follow up environmental studies. Justification for this decision is presented within the following sections of this ROD.

1.5 Site Characteristics

1.5.1 Topography and Surface Features

The generally flat topography of MCB, Camp Lejeune is typical of the North Carolina Coastal Plain. Elevations on the Base vary from sea level to 72 feet above mean sea level (msl). The elevation in the vicinity of Site ranges from 8.2 to 13.4 feet above msl.

The surface of Site 90 is covered with a mix of grasses and trees, asphalt roads and parking lots, concrete sidewalks and parking lots, and various structures. The topographical high point is located in the vicinity of Building BB-2 and the low point is in the vicinity of the temporary well 90-TW02 located near BB-245. The natural topography of the site has been modified by man-made features such as stormwater collection systems, concrete and asphalt paved parking lots, and various structures which interfere with the natural drainage and infiltration of stormwater. Rain water is collected by a series of stormwater collection systems and eventually travels through various ditches and streams to the New River. Based on the United States Geological Survey (USGS) topographical map for the Camp Lejeune Quadrangle and the site survey conducted as part of the Focused RI, the majority of the site lies above the 100-year floodplain of the New River.

1.5.2 Site Geology

Based on the soil borings that have been advanced at Site 90, the soil conditions are generally uniform throughout the study area. Typically, the shallow soils consist of unconsolidated deposits of sand with varying percentages of silt intermixed with localized clay and peat lenses. These soils represent the Quaternary age "undifferentiated" deposits which overlay the Belgrade and River Bend Formations.

Beneath the undifferentiated deposits resides gray, limestone fragments with some shell fragments, and varying percentages of sand and silt. This soil represents the uppermost portions of the River Bend Formation. The Belgrade Formation (semi-confining unit for the Castle Hayne aquifer) has apparently been eroded away in the vicinity of this site. This is not uncommon, as literature states that the semi-confining unit may be eroded in places throughout the Base (Cardinell, et al. 1993).

1.5.3 Site Hydrogeology

Hydrogeologic characteristics in the vicinity of the site were evaluated by reviewing existing information and installing a network of shallow monitoring wells across the site. Although Catlin had installed three wells (IR90-MW16, IR90-MW17 and IR90-MW18) in the Castle Hayne aquifer during an UST investigation, the relatively close proximity of the wells to each other does not allow for an accurate analysis of the aquifer.

Groundwater was encountered at varying depths during the drilling program. The variation was primarily attributed to topographical changes and variations in the elevation of the water table. In general, the groundwater was encountered between 5 and 10 feet below ground surface (bgs) during field activities.

A single round of groundwater measurements were collected during the field program on April 26, 1997. Groundwater elevations, flow patterns and gradient calculations are illustrated on Figure 90-2. The data indicates that groundwater located in the northern half of the site flows south at a estimated average gradient of 4.9×10^{-3} feet per foot (ft/ft). Groundwater contours on the southern half of the site receive localized recharge in the vicinity of temporary monitoring well 90-TW01 and localized discharge in the area of 90-TW06. It is suspected that the recharge is the result of run-off of the adjacent parking lot located to the south of temporary well 90-TW01 and that groundwater is discharging into the ditch located near 90-TW06. These phenomena created by urbanization affect the southern flow observed across the site.

1.5.4 Identification of Water Supply Wells

All of the water supply wells at MCB, Camp Lejeune utilize the Castle Hayne aquifer. The Castle Hayne aquifer is a highly permeable, semi-confined aquifer that is capable of yielding several hundred to 1,000 gallons per minute (gpm). Figure 90-3 identifies the location of the water supply wells within a one-mile radius of Site 90. Five active wells are located within a one-mile radius, including BB44, BB47, BB218, 138220, and BB221. Production well BB44 is located approximately 1,600 feet from the site. The total depth of this well is 62 feet and is screened from 32 to 62 feet bgs. This well is suspected to have been impacted by surface water infiltration due to its relatively shallow screen. Review of drilling logs for this well indicate the presence of confining units above the shallow screened intervals, thus this well is not likely affected by surface water (Geophex, 1991). The remaining four active wells have screen intervals greater than 40-53 feet bgs. Production well BB44 was sampled in January and June 1997. For these sampling events, all volatile organic compounds (VOCs) tested for by USEPA method 524.2 were below the analytical laboratory's minimum detection limit of 0.5 micrograms per kilogram ($\mu\text{g/kg}$).

1.5.5 Nature and Extent of Contamination

1.5.5.1 Three Well Site Check

The three well site check included the installation of three monitoring wells (90-MW01 through 90-MW03) around the former UST basin. These wells were installed to depths that ranged from 9 to 18.5 feet bgs. Groundwater samples were collected from each well and analyzed for benzene, toluene, ethylbenzene, and total xylenes (BTEX). Soil samples collected from each of the well boreholes and were analyzed for total petroleum hydrocarbon (TPH) and oil and grease.

The results from this investigation indicated:

- TPH-diesel range concentrations ranging from 142,000 $\mu\text{g/kg}$ to 690,000 $\mu\text{g/kg}$.
- TPH-lubrication oil range concentrations ranging from 120,000 $\mu\text{g/kg}$ to 1,700,000 $\mu\text{g/kg}$.
- Total oil and grease concentrations ranging from 870,000 $\mu\text{g/kg}$ to 3,800,000 $\mu\text{g/kg}$.
- Maximum concentrations of 2.7 micrograms per liter ($\mu\text{g/L}$) benzene, 5.1 $\mu\text{g/L}$ toluene, 11.0 $\mu\text{g/L}$ ethylbenzene, and 48.0 $\mu\text{g/L}$ total xylenes within the groundwater. No free phase product was noted in any of the wells.

1.5.5.2 Leaking Underground Storage Tank CSA, Building BB-9

The CSA was conducted to determine site subsurface characteristics and the impact of petroleum releases associated with the former heating oil USTs. Twelve HydroPunchTM penetrometers were installed to provide preliminary data. Groundwater samples collected via HydroPunchTM were analyzed for polynuclear aromatic hydrocarbons (PAHs). Twelve shallow monitoring wells (90-MW04 through 90-MW15) and three intermediate (90-MW16 through 90-MW18) monitoring wells were installed to determine the horizontal and vertical extent of petrochemical contamination in the former UST area. Soil samples were collected from eleven boreholes and analyzed for TPH, Toxicity Characteristic Leaching Procedure (TCLP) organics and metals, flashpoint, purgeable

aromatics, and soil pH. Groundwater samples collected from the newly installed monitoring wells were analyzed for PAHs, purgeable organics, RCRA metals, and drinking water (VOCs). The results of the CSA indicated:

- Cadmium, lead, and silver were detected in monitoring wells 90-MW04, 90-MW05, 90-MW06, and 90-MW15, at levels that exceeded NCWQS. In addition, monitoring wells 90-MW05 and 90-MW06 exhibited levels of chromium that exceeded NCWQS.
- Total chlorinated hydrocarbons associated with the northern plume included chloroform, 1,1,1-trichloroethane, dibromochloromethane, and bromo-dichloromethane. Benzene was also associated with the northern plume. PAHs associated with the northern plume included acenaphthalene, anthracene, and benzo(a)anthracene. The northern plume appeared to have been centered near Building BB210 on the east side of Peach Street. Concentration ranges associated with the northern plume are noted below.

| | |
|--------------------------------|-----------------------|
| Total Chlorinated Hydrocarbons | 8.7 µg/L to 16.0 µg/L |
| Benzene | 1.7 µg/L to 2.2 µg/L |
| Total PAHs | 5.4 µg/L to 7.9 µg/L |

- Total chlorinated hydrocarbons associated with the southern plume included chloromethane, bromomethane, chloroform, 1,1,1-trichloroethane, dibromochloromethane, bromodichloromethane, and 1,2,3-trichloropropane. Total BTEX associated with the southern plume included benzene, toluene, and m,p-xylenes. Total PAHs associated with the southern plume included naphthalene, acenaphthalene, phenanthrene, fluoranthene, pyrene, benzo(a)anthracene, and chrysene. The southern plume appeared to have been centered around the monitoring well BB9-4 (90-MW04). Concentration ranges associated with the southern plume are noted below.

| | |
|--------------------------------|----------------------|
| Total Chlorinated Hydrocarbons | 8.7 µg/L to 16 µg/L |
| Total PAHs | 9.5 µg/L |
| Total BTEX | 2.2 µg/L to 2.5 µg/L |

- Soil contamination was identified in an area located on the east side of Peach Street, extending from monitoring well 90-MW07 to an area in the vicinity of Building 90-MW09 and the three existing 1,000-gallon ASTs. Soil contamination detected in the sample collected from monitoring well 90-MW07 consisted of BTEX and other potentially petroleum/fuel-related compounds. Soil contamination detected in the samples collected from monitoring wells in the vicinity of 90-MW09 and the former UST basin consisted primarily of chlorinated hydrocarbon contamination. Gasoline range TPH contamination was detected only in samples collected from 90-MW18 at two depths (7.5 to 10.0 feet and 22.5 to 25.0 feet) at concentrations exceeding North Carolina action levels for soils contaminated with TPH-gasoline.
- Total BTEX in soil included benzene, toluene, ethylbenzene, m,p-xylenes, and o-xylenes. Other potentially petroleum/fuel-related contamination included N-propyl

benzene, 1,3,5-trimethylbenzene, 1,2,4-trimethylbenzene, and naphthalene. Chlorinated hydrocarbons included 1,1,1-trichloroethane and tetrachloroethane (PCE).

Maximum contaminant levels are noted below.

| | |
|--------------------------------------|----------------------|
| Total BTEX | 17.5 µg/kg (90-MW07) |
| Total other petroleum/fuel compounds | 19.0 µg/kg (90-MW07) |
| Total Chlorinated Hydrocarbons | 8.6 µg/kg (90-MW11) |

1.5.5.3 Focused RI

The field investigation at Site 90 was conducted in April to May 1997 to gather data necessary to determine the horizontal and vertical extent of soil contamination identified in previous investigations, and if groundwater contamination had migrated horizontally and vertically. The field investigation included a soil investigation, a groundwater investigation, a site survey, and investigative derived waste (IDW) management.

Findings of the Focused RI

Subsurface Soils

- VOCs were detected in soil samples submitted to the mobile laboratory.
- Acetone was detected in the three confirmatory samples submitted to the fixed-base laboratory. It is believed these detections are not site-related for the following reasons:
 - ▶ The site has no history of acetone use.
 - ▶ The soil sample was collected from immediately above the water table but no acetone was detected in groundwater samples.
 - ▶ The acetone detections are most likely associated with laboratory extraction and cleaning procedures and/or field decontamination procedures.
- Although not detected in the mobile laboratory, toluene was detected in all three confirmatory samples submitted to the fixed-base laboratory. This contamination does not appear to be related to a single source. Detections in soil boring 90-TWSB05 may be related to contamination detected during the CSA. Contamination detected in 90-TWSB06 is likely the result of runoff from an adjacent parking lot. The source of toluene contamination in 90-TWSB07 is unknown. These detections do not form a plume or pattern that would suggest that existing site practices are the source.
- Pesticides, 4,4'-DDE and 4,4'-DDT, were detected in a single soil sample submitted to the fixed-base laboratory. This site does not have a history of pesticide mixing

and storage. Previous activity-wide pest control applications are the most probable source of these detections.

- One semivolatile organic compound (SVOC), bis(2-ethylhexyl)phthalate, was detected in a confirmatory sample that was submitted to the fixed-base laboratory. This detection is not considered to be site-related. This compound is likely associated with plastic products such as the plastic bags used to store distilled water during field decontamination procedures.
- A total of 15 metals and one salt were detected in soil samples submitted to the fixed-base laboratory. Iron exceeded the North Carolina SSL. The detected inorganics, including iron, are considered to be naturally occurring and were within the range of base background levels. Base background levels for inorganics were established by compiling surface soil and subsurface soil concentrations from samples that were collected from areas known to not have been used for site operations or disposal activities.
- Chlorinated hydrocarbons were not detected in any samples collected during the Focused RI.

The results of the sample analysis from the fixed base laboratory appear in Table 90-1.

Groundwater

- Tetrachloroethene (PCE) was detected in a sample submitted to the mobile laboratory at a level of 0.3 µg/L. This level does not exceed the NCWQS (0.7 µg/L) for this contaminant. However, one of the confirmatory samples submitted to the fixed-base laboratory exhibited a concentration of 7 µg/L. This level of contamination exceeds the NCWQS for PCE. These detections are potentially site-related based on past history.
- Chloroform was detected by the mobile laboratory in groundwater samples collected from all seven temporary wells, but in none of the samples collected from permanent wells. These detections are most likely associated with the chlorinated potable water used during field decontamination procedures and are not site-related.
- A single SVOC, bis(2-ethylhexyl)phthalate, was detected in five of the eight confirmatory samples that were submitted to the fixed-base laboratory. These detections are not considered to be site-related. The concentrations in samples collected from monitoring wells were less than ten times the concentration detected in the field blanks. No other organic compounds were detected in the confirmatory sample submitted to the fixed-base laboratory.
- A total of 12 metals and three salts were detected in the confirmatory samples submitted to the fixed-base laboratory. These compounds are considered to be naturally occurring and not site-related. The concentrations of iron and manganese detected in confirmatory samples exceeded NCWQS. However, concentrations of these compounds were within the range of base background levels. The concentrations of iron and manganese detected in confirmatory samples were within

the range of base background levels. Base background levels for inorganics in groundwater were established by compiling groundwater concentrations from samples collected from monitoring wells installed in areas known not to have been impacted by site activities, or upgradient of site activities across the Base.

The results of the sample analysis from the mobile and fixed base laboratories appear in Tables 90-2 and 90-3.

1.6 Summary of Site Risks

A qualitative risk assessment for Site 90 was conducted based on data generated during the sampling and analytical phase of the Focused RI. The risk assessment evaluated the projected impact of contaminants of potential concern (COPCs) on human health and/or the environment, now and in the future in a "no further action scenario", and identified areas of concern (AOCs) with respect to established federal and state standards and criteria. The components of the qualitative risk assessment include hazard identification, qualitative evaluation of COPCs, uncertainty analysis, and a summary of results.

The soil and groundwater samples collected during the Focused RI sampling effort were analyzed by two separate laboratories: a mobile (on-site) laboratory and a fixed base (off-site) laboratory. Soil and groundwater samples were submitted to the mobile laboratory for VOC analysis only in order to determine the nature and extent of VOC contamination at Site 90. A fraction (over 10 percent) of the samples were sent to the fixed base laboratory for confirmation purposes. These confirmation samples were analyzed for VOCs, SVOCs, pesticides/polychlorinated biphenyls (PCBs), and metals. Analytical data from both laboratories were used in the qualitative risk assessment.

It is important to note the absence of surface soil data in this qualitative risk assessment. Surface soil was not investigated during the Focused RI. The Focused RI was divided into two phases. The purpose of the first phase of the Focused RI was to determine if contamination existed near the source in the subsurface soils and groundwater in the vicinity of Site 90. In other words, the investigation was "focused" on the source area. A second phase was to be completed if there were any data gaps in the first phase. Therefore, this qualitative risk assessment focused on the subsurface soils and groundwater of the source area.

Although shallow groundwater is not utilized as a potable source at Site 90, the shallow groundwater at the site was evaluated as an exposure source. It should be noted that development of the shallow aquifer for potable use is unlikely because of the general water quality in the shallow zone and poor flow rates. However, there remains the possibility that upon closure of this facility, residential housing could be constructed and shallow groundwater used for potable purposes in the future. Therefore, shallow groundwater was included in this qualitative risk assessment.

USEPA's Risk Assessment Guidance for Superfund (RAGS) provides the criteria used to establish COPCs (USEPA, 1989). A contaminant must not necessarily fit into all of the USEPA defined categories to be retained as a COPC. Criteria used in selecting COPCs from constituents detected during the field sampling and analytical phase of the Focused RI included comparison to USEPA Region III RBCs, comparison to SSLs, and a comparison to field and laboratory blank data. Background or naturally occurring levels were also used as comparative criteria in the qualitative analysis.

The primary criterion used in selecting a chemical as a COPC at Site 90 was comparing the maximum detected sample concentration to the USEPA Region III RBCs (USEPA, 2000). In conjunction with the concentration comparisons to the USEPA Region III RBCs, subsurface soil sample concentrations were compared against SSLs. An evaluation of laboratory contaminants was also conducted. Furthermore, calcium, magnesium, potassium, and sodium were detected in almost every sample, regardless of the medium; however, these constituents were considered to be essential nutrients (USEPA, 1995) and were therefore, not retained as COPCs in any medium under investigation at Site 90.

1.6.1 Subsurface Soil COPCs

Mobile Laboratory

Seven subsurface soil samples were analyzed for VOCs by the mobile laboratory. There were no VOCs detected in the Site 90 subsurface soil samples. Therefore, no VOCs were retained as COPCs for subsurface soil analyzed by the mobile laboratory.

Fixed Base Laboratory

Three subsurface soil samples were analyzed at the fixed base laboratory for VOCs. Acetone and toluene were detected at maximum concentrations less than their respective residential soil RBCs and SSLs. Therefore, acetone and toluene were not retained as COPCs.

Three subsurface soil samples were analyzed for SVOCs. Bis(2-ethylhexyl)phthalate was detected at a concentration less than its residential soil RBC and SSL in one sample; therefore, it was not retained as a COPC.

Three subsurface soil samples were analyzed for pesticides/PCBs. 4,4'-DDE and 4,4'-DDT were detected at concentrations less than their respective residential soil RBCs and SSLs in one sample. There were no PCBs detected in the subsurface soil at Site 90. Therefore, no pesticides or PCBs were retained as subsurface soil COPCs.

Three subsurface soil samples were analyzed for inorganics. Aluminum, barium, beryllium, chromium, cobalt, copper, manganese, nickel, selenium, vanadium, and zinc were detected at maximum concentrations less than their respective residential soil RBCs and SSLs (if an SSL is established). Lead was detected in all of the samples at a maximum concentration of 3.3 milligrams per kilogram (mg/kg), which is less than the USEPA lead action level for soil of 400 mg/kg. Therefore, these inorganics were not retained as COPCs. Iron detected in all three samples exceeded the SSL and was retained as a COPC.

In summary, only iron was retained as a COPC for Site 90 subsurface soil.

1.6.2 Groundwater COPCs

Mobile Laboratory

Twenty-five groundwater samples were analyzed for VOCs only by the mobile laboratory. PCE was detected in one out of twenty-five samples at a concentration less than its tap water RBC. Therefore, it was not retained as a COPC. Chloroform was detected in seven out of twenty-five samples at concentrations exceeding its tap water RBC and was retained as a groundwater COPC.

Fixed Base Laboratory

Eight groundwater samples were analyzed for VOCs by the fixed base laboratory. One VOC, PCE, was detected in one of eight samples at a concentration that exceeded its tap water RBC. Therefore, PCE was retained as a groundwater COPC.

Eight groundwater samples were analyzed for SVOCs. Bis(2-ethylhexyl)phthalate was detected in five out of eight samples at a maximum detected concentration that exceeded its tap water RBC. However, bis(2-ethylhexyl)phthalate was detected in blanks at a maximum concentration of 10 µg/L. Since bis(2-ethylhexyl)phthalate is a common lab contaminant, this concentration is multiplied by 10 to yield a blank concentration of 100 µg/L. Because the sample concentration (30 µg/L) is less than the comparison concentration, bis(2-ethylhexyl)phthalate was not retained as a COPC.

Eight groundwater samples were analyzed for pesticides/PCBs. There were no pesticides or PCBs detected in the groundwater samples. Thus, no pesticides or PCBs were retained as groundwater COPCs.

Eight groundwater samples were analyzed for inorganic analytes. The following inorganics were not retained as COPCs because they were detected at concentrations less than their respective tap water RBCs: aluminum, barium, chromium, cobalt, nickel, selenium, vanadium and zinc. Lead was detected in one out of eight groundwater samples at 1.9 µg/L, which is less than the lead action level for tap water (15 µg/L). Therefore, lead was not retained as a COPC.

Arsenic, iron, and manganese were detected at maximum concentrations that exceeded their respective tap water RBCs. Therefore, these inorganics were retained as groundwater RBCs.

In summary, the following compounds and analytes were retained as groundwater COPCs for Site 90: chloroform, PCE, arsenic, iron, and manganese.

1.6.3 Summary of Site Risk Assessment Results

- Iron was detected in three out of three subsurface soil samples analyzed by the fixed base laboratory at concentrations that exceeded the SSL. However, iron is a naturally occurring element in soil, and these concentrations were within background concentrations. In addition, iron is considered to be an essential nutrient.
- Chloroform was detected in seven out of twenty-five groundwater samples analyzed by the mobile laboratory. All detected concentrations exceeded the tap water RBC for chloroform.
- PCE was detected in one out of eight groundwater samples analyzed by the fixed base laboratory at a concentration that exceeded the RBC. The history of Site 90 indicates that this was formerly the location of a dry cleaning facility. Based on this history, it is possible that the presence of PCE is site-related.
- Arsenic was detected in one out of eight groundwater samples analyzed by the fixed base laboratory at a concentration that exceeded its tap water RBC. Arsenic concentrations were within the range of base background levels of arsenic found at Camp Lejeune.

- Iron was detected in seven out of eight groundwater samples analyzed by the fixed base laboratory at a maximum detected concentration that exceeded the tap water RBC. However, it should be noted that iron is considered an essential nutrient. Recently, iron was given a RBC value and toxicity values with which to evaluate potential human health risks. The studies that prompted the addition of a RBC value for iron are provisional only and have not undergone formal review by the USEPA. For these reasons, the selection of iron as a COPC for evaluation in human health risk assessments is associated with some uncertainty. By evaluating iron in the risk assessment, a conservative approach is taken and potential toxic effects are not expected to be underestimated.
- Manganese was detected in six out of eight groundwater samples analyzed by the fixed base laboratory at a maximum detected concentration that exceeded the RBC. Manganese concentrations were within the range of base background levels of manganese found at Camp Lejeune.

Iron was the only COPC retained for Site 90 subsurface soil but is not considered site-related and is a naturally occurring essential nutrient. Of the COPCs retained for Site 90 groundwater, only the PCE is potentially site-related. The PCE in groundwater may pose a potential human health risk if the groundwater at the site is consumed. Chloroform, arsenic, and manganese were detected at concentrations greater than their respective RBCs, but are not considered site-related. Lastly, iron concentrations exceeded the RBC but is considered an essential nutrient.

A summary of COPCs for Site 90 appears in Table 90-4.

1.7 Follow Up Investigations

In order to verify the presence or absence of contaminants that were identified as COPCs during the Focused RI, additional studies were completed. The results of these studies are presented in the following paragraphs.

1.7.1 Supplemental Groundwater Investigation

The Supplemental Groundwater Investigation at Site 90 was developed to gather data necessary to determine if contaminants such as chloroform and bis(2-ethylhexyl)phthalate detected during the first phase of the Focused RI are site-related. Sampling was also conducted to confirm detected levels of PCE.

To gather this information, existing monitoring wells at Site 90 containing these constituents were resampled at the request of NC DENR. The request by NC DENR came in the form of a comment on the Draft Focused RI. Monitoring wells IR90-MW04, -MW06, -MW13, -MW16IW, and -MW18IW were proposed for sample collection in response to NC DENR's comments. The samples were collected between November 1 and 3, 1999 and analyzed for VOCs and SVOCs.

Findings of the Supplemental Groundwater Investigations

The analytical results of the groundwater sampling performed at Site 90 are presented in the following sections. A summary of analytical results by media is provided in Table 90-5.

- Methylene Chloride was detected in all samples from Site 90. The highest concentration was 18 µg/L in sample 90MW0499D which exceeded the NCWQS (5 µg/L) and USEPA Region III RBC (4.1 µg/L). However, methylene chloride was detected in field blank samples at a concentration of 4.0 µg/L. The detected concentrations of methylene chloride did not exceed ten times the maximum concentration detected in any blank. As a result of the detections in field blank samples and internal laboratory blanks, methylene chloride is not considered a site related contaminant.
- Acetone was detected in all groundwater samples collected from Site 90 except for samples 90MW04DUP and 90MW0699D. The maximum detected concentrations of acetone at Site 90 was 7.0 µg/L in groundwater sample 90MW18IW99D. This concentration did not exceed any of the three comparison criteria standards. Like methylene chloride, acetone was detected in quality assurance/quality control (QA/QC) blank samples (field and laboratory) ranging in concentration from 3.0 µg/L to 29.0 µg/L. The highest concentration was detected in the laboratory method blank. Acetone concentrations detected in the groundwater samples collected from the sites did not exceed ten times the maximum concentration detected in any blank. Like methylene chloride, acetone is not considered to be a site related contaminant.
- 2-Butanone was detected at Site 90 in groundwater sample 90MW18IW99D. The detected concentration did not exceed the NCWQS or the Region III RBC for 2butanone. Federal Maximum Contaminant Levels (MCLs) have not been established for 2-butanone. 2-Butanone is a typical laboratory contaminant and was detected in a laboratory method blank at a concentration of 6.0 µg/L. This compound was not detected in any groundwater sample at concentrations that exceed ten times the maximum concentration detected in any blank. Due to detections in the blank samples and its documented occurrence as a common laboratory artifact, it is suspected that detections of 2-butanone are not site related but rather a laboratory artifact.
- Chloroform was detected in seven groundwater samples collected from Site 90 during the Focused RI. No chloroform was detected during the supplemental investigation; therefore, this compound is now considered not to be related to Site 90.
- TCE was detected in the sample (2 µg/L) and duplicate sample (3 µg/L) collected from existing monitoring well IR90-MW04. The detected concentration in the duplicate sample exceeds the NCWQS of 2.8 µg/L and both results exceed the RBC of 1.6 µg/L . Neither result exceeds the Federal MCL of 5 µg/L. This compound appears to be a site-related contaminant.
- One SVOC was detected in groundwater samples collected from Site 90. Bis(2-ethylhexyl)phthalate was detected in several of the samples and in a laboratory method blank at a concentration of 2.0 µg/L. Bis(2-ethylhexyl)phthalate was detected in groundwater samples 90MW0699D, 90MW1399D, and 90MW18IW99D. Sample 90MW1399D, in which bis(2-ethylhexyl)phthalate was detected, exceeded both the NCWQS (3.0 µg/L) and the RBC (4.8 µg/L) for the compound. All detected concentrations of bis(2-ethylhexyl)phthalate from Site 90 did not exceed ten times the concentration detected in the blank and were considered a laboratory artifact. These results were dismissed from further consideration as a site-related contaminant.

Based on these results, additional investigative activities were recommended in the vicinity of monitoring well 90-MW04.

1.7.2 Temporary Well Delineation Study

Results of this study were used to determine if the TCE detection in 90-MW04 is part of a larger plume at the site, or if an isolated area is impacted. Three temporary monitoring wells were installed in the vicinity of monitoring well IR90-MW04 on July 18, 2000. One of the wells (TP-03) was installed between monitoring well IR90-MW04 and Building BB 16. The other two wells (TP-01 and TP-02) were installed downgradient from monitoring well IR90-MW04. Samples were analyzed for VOCs and the results of the sample analysis appear in Table 90-6.

Findings of the Temporary Well Delineation Study

- Methylene chloride was detected in each of the three groundwater samples and the trip blank sample submitted for analysis. Samples SITE90TP02, SITE90TP03, and SITE90TB01 all reportedly contained methylene chloride at a concentration of 2J µg/L. The "J" qualifier indicates an estimated result. Sample SITE90TP01 contained 1J µg/L of methylene chloride. This compound is a common laboratory contaminant and is likely related to laboratory procedures and not the site activities.
- Acetone is another common laboratory contaminant that was detected in groundwater samples SITE90TP01 (5J µg/L) and SITE90TP02 (6J µg/L). This compound is not likely to be site-related, but rather related to laboratory procedures.
- The only other compound detected in the samples was xylene. It was detected in groundwater sample SITE90TP01 at a concentration of 2J µg/L. This compound is likely site-related, but was not detected at concentrations exceeding NCWQS for xylene (530 µg/L).
- No TCE was detected in any of the samples collected from the temporary monitoring wells. Therefore, the detection of TCE in monitoring well IR90-MW04 may be the result of an isolated or small scale release from Building BB-16. There is no evidence to suggest that the TCE detected in monitoring well IR90-MW04 is part of a larger plume at the site.

1.8 Summary of Site Conditions

Five environmental investigations have been conducted at Site 90: the Three Well Site Check, the CSA, the Focused RI, the Supplemental Groundwater Investigation, and the Temporary Well Delineation Study. From these studies, it has been concluded that the only site-related constituent that appears to be remaining at the site is TCE. The TCE only slightly exceeded screening criteria and is found in a small area around one monitoring well. Accordingly, there is no evidence of a large scale PCE impacted area.

1.9 Current and Potential Future Site and Resource Uses

Site 90 is currently used for commercial purposes including an administrative office, commissary, restaurant, chapel, dry cleaning (drop off, pick up only) and shoe repair distribution center, fire station, gymnasium, and heat plant. The ASTs that store diesel fuel No. 2, an oil-water separator, a fuel unloading area, and three tanks containing anti-corrosive materials are potential sources of contaminants that are associated with the heat plant. This type of land use at Site 90 is unlikely to change in the immediate future.

As discussed in the previous section, five active groundwater supply wells are located within a one-mile radius of Site 90. These supply wells will likely remain active in the immediate future.

1.10 Explanation of Significant Changes

The PRAP presents the selected remedy as the preferred alternative for Site 90. No significant changes to the remedy have been made.



Baker Environmental, Inc.

TABLES

TABLE 90-1

SUMMARY OF FOCUSED RI DATA

ORGANICS AND INORGANICS IN SUBSURFACE SOIL

FIXED BASE LABORATORY

OPERABLE UNIT NO. 17 (SITE 90)

MCB, CAMP LEJEUNE, NORTH CAROLINA

RECORD OF DECISION

CTO-0344

| Constituent | Range/Frequency | | Comparison to Criteria | | | | | | COPC Selection ⁽²⁾ |
|-------------------------------|------------------------------|---|---|--|-----------------------|--|-----------------------|------------------------------------|-------------------------------|
| | Range of Positive Detections | No. of Positive Detects/ No. of Samples | Twice the Average Base Specific Background ⁽¹⁾ Concentration | No. of Times Exceeded Twice the Average Background Concentration | Residential RBC Value | Positive Detects Above Residential RBC Value | North Carolina SSL | Positive Detects Above NCSSL Value | |
| Volatiles (µg/kg): | | | | | | | | | |
| Acetone | 74 - 360 | 3/3 | NA | NA | 780,000 | 0 | 2,810 | 0 | No |
| Toluene | 22 - 80 | 3/3 | NA | NA | 1,600,000 | 0 | 7,270 | 0 | No |
| Semivolatiles (µg/kg): | | | | | | | | | |
| Bis(2-ethylhexyl)phthalate | 41J | 1/3 | NA | NA | 46,000 | 0 | 6,670 | 0 | No |
| Pesticides (µg/kg): | | | | | | | | | |
| 4,4'-DDE | 29 | 1/3 | NA | NA | 1,900 | 0 | 35,000 ⁽⁴⁾ | | No |
| 4,4'-DDT | 3.6J | 1/3 | NA | NA | 1,900 | 0 | 1,360 | 0 | No |
| Inorganics (mg/kg): | | | | | | | | | |
| Aluminum | 1,010J - 2,950J | 3/3 | 7,375.3 | 0 | 7,800 | 0 | -- | NA | No |
| Barium | 3J - 6J | 3/3 | 14.2 | 0 | 550 | 0 | 848 | 0 | No |
| Beryllium | 0.02J | 1/3 | 0.19 | 0 | 16 | 0 | 3.38 | 0 | No |
| Calcium | 30.9J - 559J | 3/3 | 391.5 | 1 | NE | NA | -- | NA | No |
| Chromium | 1.7J - 5.2J | 3/3 | 12.6 | 0 | 23 | 0 | 27.2 | 0 | No |
| Cobalt | 0.06J - 0.21J | 2/3 | 1.5 | 0 | 160 | 0 | -- | NA | No |
| Copper | 0.14J - 0.86J | 3/3 | 2.4 | 0 | 310 | 0 | 704 | NA | No |
| Iron | 225J - 965J | 3/3 | 7,252.1 | 0 | 2,300 | 0 | 151 | 3 | Yes |
| Lead | 1.7 - 3.3J | 3/3 | 8.3 | 0 | 400 ⁽³⁾ | 0 | 270 | NA | No |
| Magnesium | 30.6J - 84.5J | 3/3 | 260.7 | 0 | NE | NA | -- | NA | No |
| Manganese | 4.2 - 6.5J | 3/3 | 7.9 | 0 | 160 | 0 | 65.2 | NA | No |

TABLE 90-1 (continued)

**SUMMARY OF FOCUSED RI DATA
ORGANICS AND INORGANICS IN SUBSURFACE SOIL
FIXED BASE LABORATORY
OPERABLE UNIT NO. 17 (SITE 90)
MCB, CAMP LEJEUNE, NORTH CAROLINA
RECORD OF DECISION
CTO-0344**

| Constituent | Range/Frequency | | Comparison to Criteria | | | | | | COPC Selection ⁽²⁾ |
|-------------|------------------------------|---|---|--|-----------------------|--|--------------------|------------------------------------|-------------------------------|
| | Range of Positive Detections | No. of Positive Detects/ No. of Samples | Twice the Average Base Specific Background ⁽¹⁾ Concentration | No. of Times Exceeded Twice the Average Background Concentration | Residential RBC Value | Positive Detects Above Residential RBC Value | North Carolina SSL | Positive Detects Above NCSSL Value | |
| Nickel | 0.49 - 0.67J | 2/3 | 3.7 | 0 | 160 | 0 | 56.4 | 0 | No |
| Selenium | 0.48J | 1/3 | 0.8 | 0 | 39 | 0 | 12.2 | 0 | No |
| Vanadium | 1.7J - 3.6J | 3/3 | 13.5 | 0 | 55 | 0 | -- | 0 | No |
| Zinc | 0.16J - 2.2J | 3/3 | 6.7 | 0 | 2,300 | 0 | 1,100 | 0 | No |

Notes:

⁽¹⁾ Soil background concentrations are based on reference background soil samples collected from MCB Camp Lejeune investigations.

⁽²⁾ COPC = Chemical of Potential Concern for human health risk assessment (yes/no).

⁽³⁾ Action Level for residential soils (USEPA, 1994).

⁽⁴⁾ Calculated by USEPA Region III.

NE = Not established

NA = Not applicable

J = Estimated Value

-- = SSL not established

TABLE 90-2
SUMMARY OF FOCUSED RI DATA
VOLATILE ORGANICS IN GROUNDWATER
MOBILE LABORATORY
OPERABLE UNIT NO. 17 (SITE 90)
MCB, CAMP LEJEUNE, NORTH CAROLINA
RECORD OF DECISION
CTO-0344

| Parameter | Groundwater Criteria | | | Frequency/Range | | Comparison to Criteria | | | COPC Selection ⁽³⁾ |
|-------------------|--------------------------------|--|---------------------------------------|--|----------------------------|------------------------------|--|----------------------------------|-------------------------------|
| | NCWQS ⁽¹⁾ (µg/L) | Maximum Base Background Concentration ⁽²⁾ | Region III Tap Water RBC Value (µg/L) | No. of Positive Detects/ No. of Samples | Concentration Range (µg/L) | Positive Detects Above NCWQS | Positive Detects Above Base Background Concentration | Positive Detects Above RBC Value | |
| Chloroform | 0.19 | NE | 0.15 | 7/25 | 1.2 - 18.8 | 7 | NA | 7 | Yes |
| Tetrachloroethene | 0.7 | NE | 1.1 | 1/25 | 0.3 | 0 | NA | 0 | No |

Notes:

⁽¹⁾ NCWQS = North Carolina Water Quality Standards for Groundwater (October, 2000).

⁽²⁾ There are no base background concentrations established for organic contaminants in groundwater.

⁽³⁾ COPC = Chemical of potential concern for human health risk assessment (yes/no).

NA = Not Applicable

NE = Not Established

TABLE 90-3
SUMMARY OF FOCUSED RI DATA
ORGANICS AND METALS IN GROUNDWATER
FIXED BASE LABORATORY
OPERABLE UNIT NO. 17 (SITE 90)
MCB, CAMP LEJEUNE, NORTH CAROLINA
RECORD OF DECISION
CTO-0344

| Parameter | Groundwater Criteria | | | Frequency/Range | | Comparison to Criteria | | | COPC Selection ⁽³⁾ |
|----------------------------|--------------------------------|--|---|--|----------------------------------|---------------------------------|--|--|-------------------------------|
| | NCWQS ⁽¹⁾ (µg/L) | Maximum base Background Concentration ⁽²⁾ | Region III Tap Water RBC Value (µg/L) | No. of Positive Detects/ No. of Samples | Concentration Range (µg/L) | Positive Detects Above NCWQS | Positive Detects Above Maximum Base Background Concentration | Positive Detects Above RBC Value | |
| Volatiles | | | | | | | | | |
| Tetrachloroethene | 0.7 | NE | 1.1 | 1/8 | 7J | 1 | NA | 1 | Yes |
| Semivolatiles | | | | | | | | | |
| Bis(2-ethylhexyl)phthalate | 3 | NE | 4.8 | 5/8 | 1J - 30 | 4 | NA | 4 | No ⁽⁴⁾ |
| Metals | | | | | | | | | |
| Aluminum | NE | NR | 3,700 | 6/8 | 19.1J - 3,110 | NA | NA | 0 | No |
| Arsenic | 50 | 570 | 0.045 | 1/8 | 5.93 | 0 | 0 | 1 | Yes |
| Barium | 2,000 | 5410 | 260 | 8/8 | 9.13 - 62J | 0 | 0 | 0 | No |
| Calcium | NE | 828,000 | NE | 8/8 | 32,300 - 135,000 | NA | 0 | NA | No |
| Chromium | 50 | 895 | 11 | 2/8 | 0.423 - 4.23 | 0 | 0 | 0 | No |
| Cobalt | NE | NR | 220 | 3/8 | 0.86J - 3.6J | NA | NA | 0 | No |
| Iron | 300 | NR | 1,100 | 7/8 | 753 - 7,480 | 4 | NA | 3 | Yes |
| Lead | 15 | 9340 | NE | 1/8 | 1.91 | 0 | 0 | NA | No |
| Magnesium | NE | NR | NE | 8/8 | 1,340J - 4,070J | NA | NA | NA | No |
| Manganese | 50 | 2110 | 73 | 6/8 | 2.4 - 180 | 3 | 0 | 2 | Yes |
| Nickel | 100 | 486 | 73 | 2/8 | 1.73 - 8.7 | 0 | 0 | 0 | No |
| Potassium | NE | NR | NE | 8/8 | 627J - 2,400 | NA | NA | NA | No |

TABLE 90-3 (continued)

**SUMMARY OF FOCUSED RI DATA
ORGANICS AND METALS IN GROUNDWATER
FIXED BASE LABORATORY
OPERABLE UNIT NO. 17 (SITE 90)
MCB, CAMP LEJEUNE, NORTH CAROLINA
RECORD OF DECISION
CTO-0344**

| Parameter | Groundwater Criteria | | | Frequency/Range | | Comparison to Criteria | | | COPC Selection ⁽³⁾ |
|-----------|--------------------------------|--|---|--|----------------------------------|---------------------------------|--|--|-------------------------------|
| | NCWQS ⁽¹⁾ (µg/L) | Maximum base Background Concentration ⁽²⁾ | Region III Tap Water RBC Value (µg/L) | No. of Positive Detects/ No. of Samples | Concentration Range (µg/L) | Positive Detects Above NCWQS | Positive Detects Above Maximum Base Background Concentration | Positive Detects Above RBC Value | |
| Selenium | 50 | NR | 18 | 4/8 | 2.3J - 4J | 0 | NA | 0 | No |
| Sodium | NE | 156,000 | NE | 8/8 | 4,650J - 13,400 | NA | 0 | NA | No |
| Vanadium | NE | 1,700 | 26 | 4/8 | 0.63J - 9.4J | NA | 0 | 0 | No |
| Zinc | 2,100 | 12,100 | 1,100 | 1/8 | 2.2J | 0 | 0 | 0 | No |

Notes:

⁽¹⁾ NCWQS = North Carolina Water Quality Standards for Groundwater (October, 1994).

⁽²⁾ There are no base background concentrations established for organic contaminants.

⁽³⁾ COPC = Chemical of potential concern for human health risk assessment (yes/no).

⁽⁴⁾ Not retained as a COPC due to blank contamination.

NE - Not Established.

NA - Not Applicable.

NR - Not Recorded in Table 1 of the draft version of the Evaluation of Metals in Groundwater
(Baker, 1994).

J - Estimated Value.

TABLE 90-4

**CONTAMINANTS OF POTENTIAL CONCERN
EVALUATED IN THE QUALITATIVE RISK ASSESSMENT
OPERABLE UNIT NO. 17 (SITE 90)
MCB, CAMP LEJEUNE, NORTH CAROLINA
RECORD OF DECISION
CTO-0344**

| Contaminant | Subsurface Soil | Groundwater |
|--------------------|------------------|------------------|
| Volatiles: | | |
| Chloroform | | X ⁽¹⁾ |
| Tetrachloroethene | | X ⁽²⁾ |
| Inorganics: | | |
| Arsenic | | X ⁽²⁾ |
| Iron | X ⁽²⁾ | X ⁽²⁾ |
| Manganese | | X ⁽²⁾ |

Notes:

- (1) Selection as a COPC based on mobile laboratory data.
- (2) Selection as a COPC based on fixed base laboratory data.

TABLE 90-5

**POSITIVE DETECTION SUMMARY OF SUPPLEMENTAL GROUNDWATER INVESTIGATION DATA
OPERABLE UNIT NO. 17 (SITE 90)
MCB, CAMP LEJEUNE, NORTH CAROLINA
CTO-0344**

| SAMPLE ID SAMPLE DATE | North Carolina Water Quality 2L Standards (µg/l) | <u>USEPA Region III Risk Based Concentrations RBCs (µg/l)</u> | 90MW0499D 11/3/99 | 90MW04DUP99D 11/3/99 | 90MW0699D 11/3/99 | 90MW1399D 11/3/99 | 90MWI61W99D 11/3/99 | 90MWI81W99D 11/3/99 |
|-----------------------------|---|---|----------------------|-------------------------|----------------------|----------------------|------------------------|------------------------|
| VOLATILES (µg/l) | | | | | | | | |
| Methylene chloride | 5 | 4.1 | <u>18</u> | 2 JB | 2 JB | 4 JB | 4 JB | 1 JB |
| Acetone | 700 | 610 | 4 JB | ND | ND | 3 JB | 6 JB | 7 JB |
| 2-Butanone | 170 | 1,900 | ND | ND | ND | ND | ND | 3 JB |
| Trichloroethene | 2.8 | 1.6 | 2 J | 3 J | ND | ND | ND | ND |
| SEMIVOLATILES (µg/l) | | | | | | | | |
| bis(2-Ethylhexyl)phthalate | 3 | 4.8 | ND | ND | 3 J | <u>8</u> J | ND | 2 JB |

NOTES:

- (1) µg/l = micrograms per liter
- (2) ND = Non detectable concentration. Concentration of compound is below method detection limit.
- (3) J = Estimated result
- (4) B = Compound was detected in laboratory blank.
- (5) Shading indicates concentration exceeded North Carolina Water Quality 2L Standard.
- (6) Underlining indicates concentration exceeded USEPA Region III Risk Based Concentrations (RBCs) for tapwater.

TABLE 90-5

**POSITIVE DETECTION SUMMARY OF SUPPLEMENTAL GROUNDWATER INVESTIGATION DATA
OPERABLE UNIT NO. 17 (SITE 90)
MCB, CAMP LEJEUNE, NORTH CAROLINA
CTO-0344**

| SAMPLE ID SAMPLE DATE | North Carolina Water Quality 2L Standards (µg/l) | <u>USEPA Region III</u> <u>Risk Based</u> <u>Concentrations</u> <u>RBCs</u> (µg/l) | Number Exceeding North Carolina Water Quality 2L Standards (µg/l) | Number Exceeding USEPA Region III Risk Based Concentrations RBCs (µg/l) | LOCATION MAXIMUM DETECT |
|-----------------------------|--|--|--|--|-------------------------------|
| VOLATILES (µg/l) | | | | | |
| Methylene chloride | 5 | 4.1 | 1/6 | 1/6 | 90MW0499D |
| Acetone | 700 | 610 | 0/6 | 0/6 | 90MW18IW99D |
| 2-Butanone | 170 | 1,900 | 0/6 | 0/6 | 90MW18IW99D |
| Trichloroethenc | 2.8 | 1.6 | 1/6 | 2/6 | 90MW04DUP99D |
| SEMIVOLATILES (µg/l) | | | | | |
| bis(2-Ethylhexyl)phthalate | 3 | 4.8 | 1/6 | 1/6 | 90MW1399D |

TABLE 90-6
POSITIVE DETECTION SUMMARY OF TEMPORARY WELL DELINEATION STUDY DATA
OPERABLE UNIT NO. 17 (SITE 90)
MCB, CAMP LEJEUNE, NORTH CAROLINA

| SAMPLE ID SAMPLE DATE | North Carolina Water Quality 2L Standards (µg/l) | <u>USEPA Region III</u> <u>Risk Based</u> <u>Concentrations</u> <u>RBCs</u> (µg/l) | SITE 90=TP01 07-19-2000 | SITE 90-TP02 07-19-2000 | SITE 90-TP03 07-19-2000 | Number Exceeding NCWQS 2L | Number Exceeding USEPA Region III RBC | LOCATION OF MAXIMUM DETECT |
|--------------------------|---|---|----------------------------|----------------------------|----------------------------|---------------------------------|--|-------------------------------|
| | | | | | | | | |
| VOLATILES (mg/kg) | | | | | | | | |
| Acetone | 700 | 610 | 5 J | 6 J | 13 U | 0/3 | 0/3 | SITE 90-TP02 |
| Methylene chloride | 5 | 4.1 | 1 J | 2 J | 2 J | 0/3 | 0/3 | SITE 90-TP02 AND TP03 |
| Xylenes (Total) | 530 | 1,200 | 2 J | 5 U | 5 U | 0/3 | 0/3 | SITE 90-TP01 |

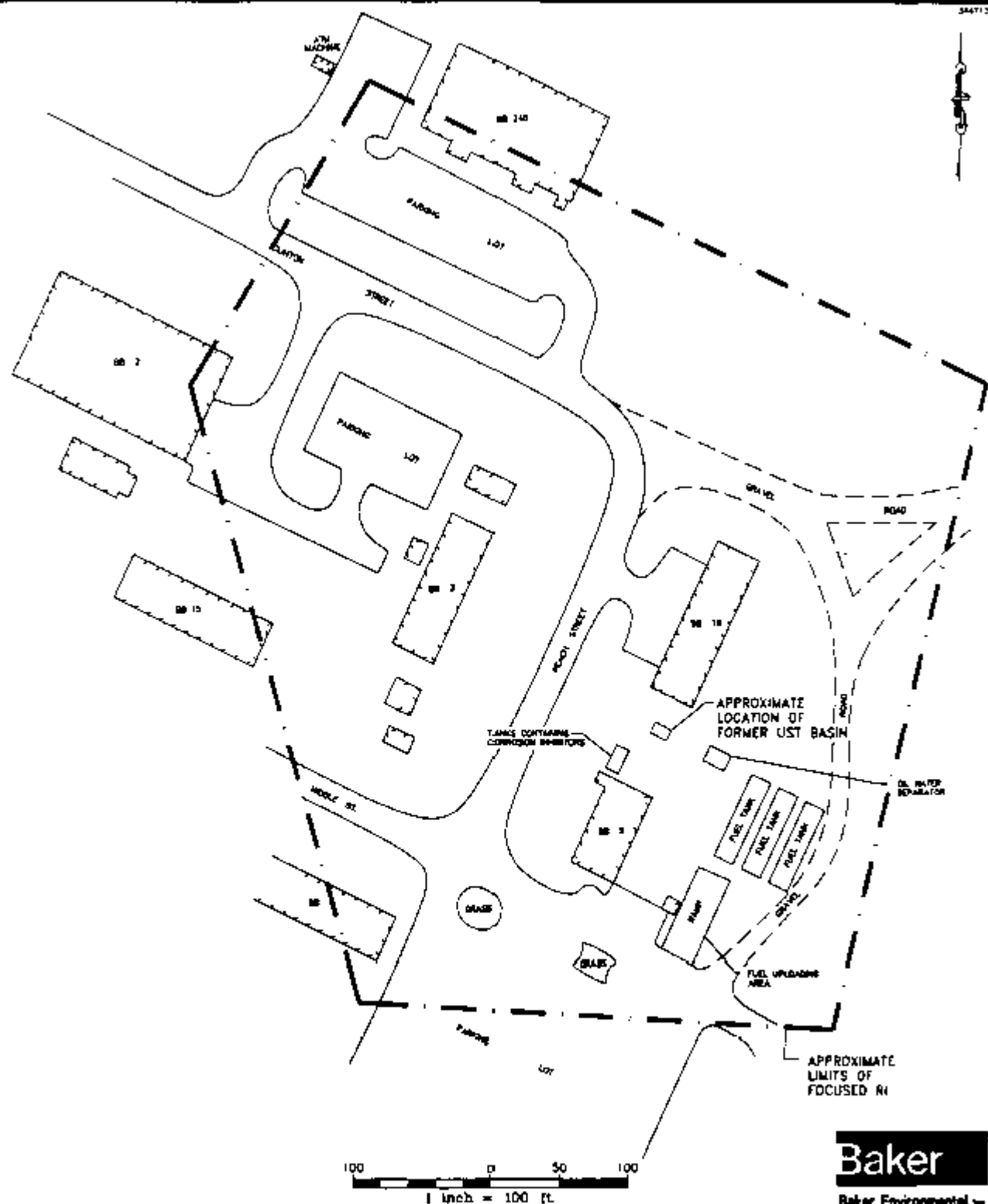
Notes:

- (1) µg/l = micrograms per liter
- (2) ND = Non detectable concentration. Concentration of compound is below method detection limit.
- (3) J = Estimated result
- (4) Shading indicates concentration exceeded North Carolina Water Quality 2L Standard.
- (5) Underlining indicates concentration exceeded USEPA Region III Risk Based Concentrations (RBCs) for tapwater.



Baker Environmental, Inc.

FIGURES

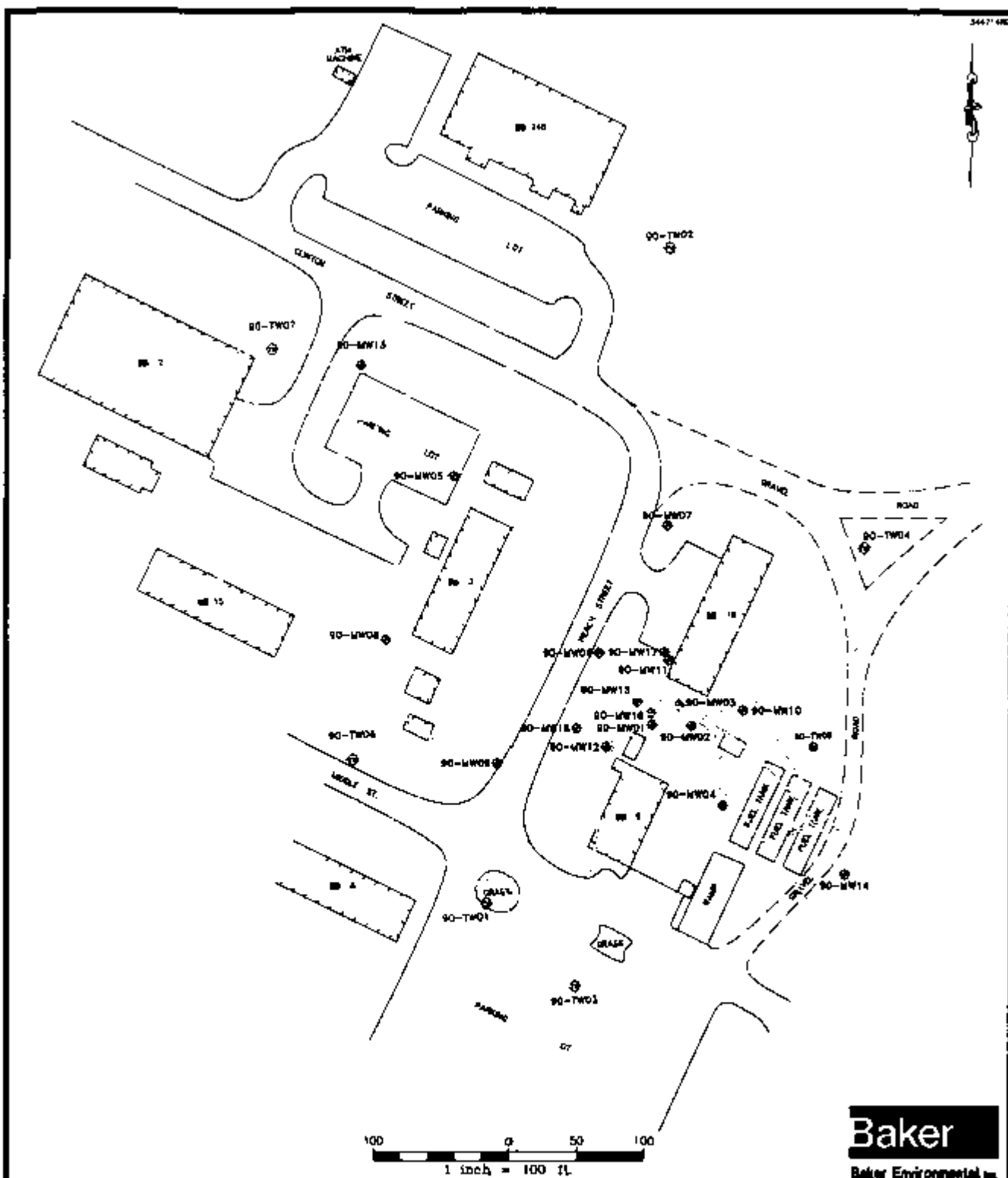


LEGEND

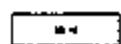





- BB 15 - BUILDING
- - EDGE OF GRAVEL ROAD
- - LIMITS OF FOCUSED RI

FIGURE 90-1
 SITE LOCATION MAP
 OPERABLE UNIT No. 17 (SITE 90)
 RECORD OF DECISION
 CTO - 0344
 MARINE CORPS BASE, CAMP LEJEUNE
 NORTH CAROLINA

SOURCE: LANIER SURVEYING COMPANY, APRIL 1997.

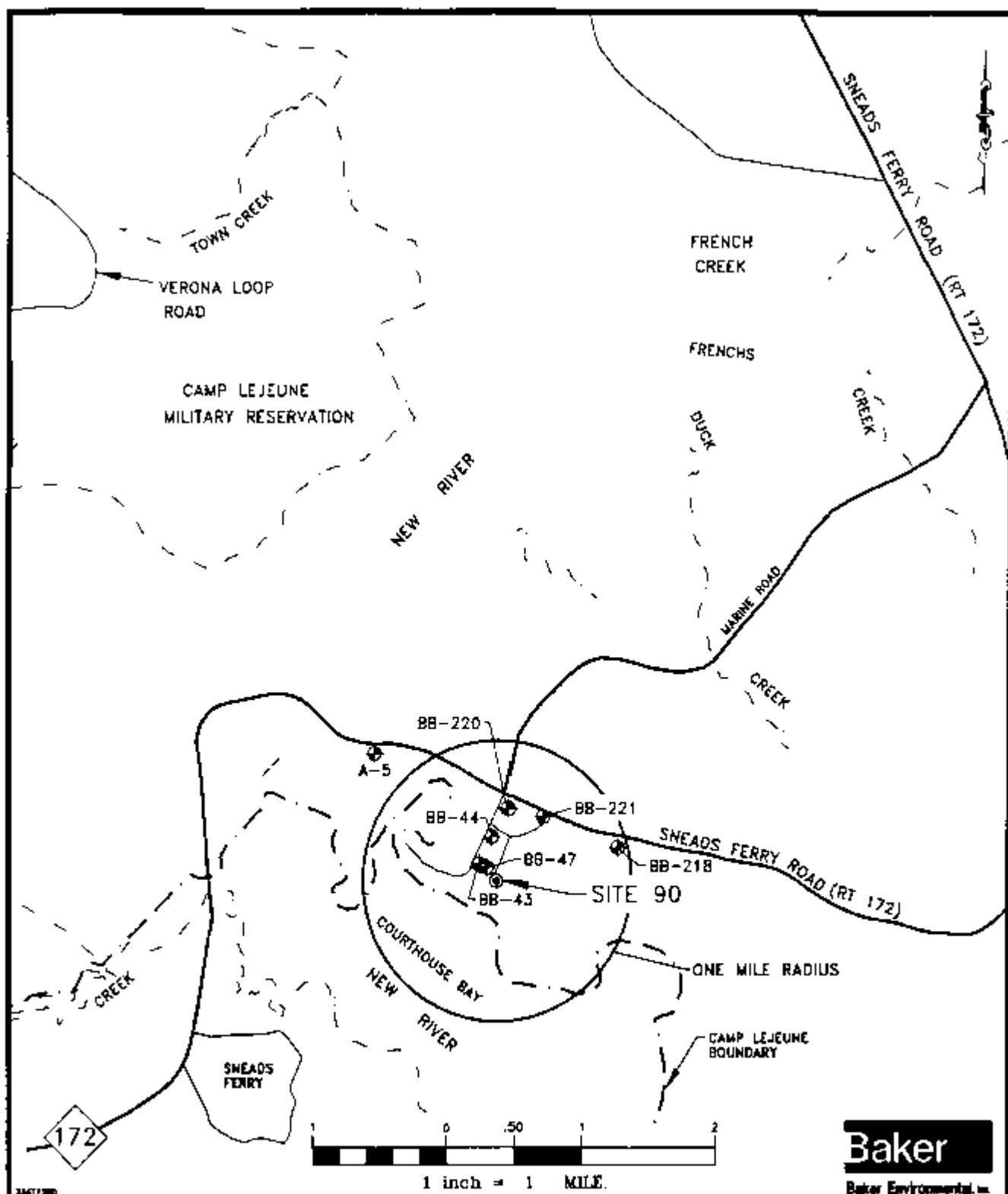


LEGEND

-  - BUILDING
-  - EDGE OF GRAVEL ROAD
-  - TEMPORARY WELL INSTALLED BY BAKER
-  - EXISTING PERMANENT MONITORING WELL
-  - GROUNDWATER CONTOUR
-  - GROUNDWATER FLOW DIRECTION

SOURCE: LANIER SURVEYING COMPANY, APRIL 1997.

FIGURE 90-2
GROUNDWATER CONTOUR MAP
OPERABLE UNIT No. 17 (SITE 90)
RECORD OF DECISION
CTO - 0344
MARINE CORPS BASE, CAMP LEJEUNE
NORTH CAROLINA



LEGEND

- ◎ - SITE
- BB-221 - ACTIVE SUPPLY WELL
- BB-43 - DEACTIVATED SUPPLY WELL (1991)

SOURCE: GEOPHEX, 1983.

FIGURE 90-3
SUPPLY WELL LOCATION MAP
OPERABLE UNIT No. 17 (SITE 90)
RECORD OF DECISION
CTO - 0344
MARINE CORPS BASE, CAMP LEJEUNE
NORTH CAROLINA

2.0 DECISION SUMMARY - SITE 91

2.1 Site Name, Location and Description

Site 91 is located in the Courthouse Bay Area of MCB, Camp Lejeune and is one of three sites that comprise Operable Unit No. 17. The previous investigations at Site 91 focused on a former UST basin where two 300-gallon steel USTs, used to store waste oil, were previously located. The former UST basin associated with Building BB-51, is located at the north end of Clinton Street, within the confines of the Marine Corps School of Engineering, northeast of Building BB-51 (Figure 91-1).

The study area associated with Site 91 is approximately 8 acres in size. The facility is currently used by the Marine Corp School of Engineering to train personnel in the operation and maintenance of heavy construction equipment. Approximately 25% of the study area is wooded and the remaining 75% is actively used by the School of Engineering. During the RI, consideration was given to three primary structures, Buildings BB-51, BB-150 and BB-73, that are actively used by the School of Engineering. Building BB-51 has small service bays for equipment maintenance and repair, and administrative offices. Building BB-150 has two service bays for larger equipment maintenance and repair. Building BB-73 is a concrete pad that serves as a temporary parking area for vehicles being serviced at Buildings BB-51 and BB-150. Vehicle access to the buildings and open areas is provided by a series of gravel and dirt roads. In addition to the primary structures there are two concrete pads located north of BB-73 that are used for the temporary storage of hazardous and potentially hazardous materials, and an abandoned building, BB-239, located 225 feet east of the former UST basin. Other areas adjacent to the structures were considered in the RI. The clear area located within the study area near Building BB-239 is used as a "laboratory" area for student equipment operators. The clear area directly north of Buildings BB-51 and BB-150 and west of the former UST is used as a temporary vehicle storage facility. Additional facilities that support activities at the School of Engineering are located adjacent to the study area. These include a bermed petroleum, oil, and lubricants area located 300 feet northwest of Building BB-51, an active tube-oil drum storage pad located approximately 250 feet north of Building BB-51, an active vehicle/equipment wash pad located approximately 170 feet north-northwest of Building BB-51, and an active hazardous/potentially hazardous materials temporary storage area of is located northeast of Building BB-51.

The nearest surface water body is a small unnamed creek that is located approximately 1,450 feet to the southwest of the former UST basin. Courthouse Bay and the New River are both approximately 3,000 feet to the west and south, respectively, of the former UST basin.

2.2 Site History and Enforcement Activities

There have been no enforcement activities conducted or are required at this site.

The 300-gallon USTs that were previously located at the site were excavated and removed in August 1992. No information was available about the age or condition of the tanks at removal. Soil samples collected during the UST closure were analyzed and revealed concentrations of TPH-oil and grease.

In 1994 four ASTs were located within the limits of the current Focused RI (Catlin, 1994). These were used to store waste oil, antifreeze, and kerosene. During the field efforts associated with the Focused RI, Baker field crews noted that these AST were no longer in existence.

Although enforcement activities at Site 91 do not include soil or groundwater remediation actions, various investigations have been conducted. These include the Focused RI conducted by Baker in 1997; a three well site check that was conducted in April 1993 by GTGS; and a comprehensive site assessment (similar to Site 90). The CSA for Building BB-51 was conducted in September 1994 by Catlin. Based on the results of the CSA Site 91 was placed in the IRP. The Focused RI was conducted under the IRP. Post-RI studies were also conducted, including the Supplemental Groundwater Investigation and Post-RI monitoring. The results of these studies are summarized in the Site Characteristics section of this document.

At the conclusion of this CERCLA decision, this site will be re-evaluated under the North Carolina UST program due to rule changes in the UST program.

2.3 Highlights of Community Participation

The Final PRAP for OU No. 17 at MCB Camp Lejeune, North Carolina was released to the public on July 11, 2001. This document was made available to the public at the information repositories maintained at the Onslow County Public Library and the MCB Camp Lejeune Library.

A public comment period regarding OU No. 17 was held from July 11, 2001 through August 10, 2001; and a public meeting was held on July 18, 2001. An advertisement for the public meeting was published in the Jacksonville Daily News on July 18, 2001. During this public meeting, representatives from the DoN and the Marine Corps discussed the preferred remedial action under consideration. Community concerns were also addressed during the public meeting.

Community comments regarding the preferred remedial action, and the response to the comments received during the noted comment period are included in the Responsiveness Summary section of this ROD.

2.4 Scope and Role of OU No. 17 (Site 91)

No Action is the selected remedial action for OU No. 17, Site 91. The No Action decision is the final recommended action for OU No. 17, Site 91. This decision is based on the findings of the Focused RI field investigation and follow up environmental studies. Justification for this decision is presented within the following sections of this ROD.

2.5 Site Characteristics

2.5.1 Topography and Surface Features

The generally flat topography of MCB, Camp Lejeune is typical of the North Carolina Coastal Plain. Elevations on the base vary from sea level to 72 feet above msl. The elevation of the site ranges from 27.5 to 34.5 feet above msl.

The surface of Site 91 is covered with a mix of grasses and wooded areas, asphalt and gravel roads and parking lots, concrete sidewalks and various structures. The topographical high point is located in the vicinity of monitoring well 91-MW06 located north of the site near the two concrete storage pads and the low point is in the vicinity of Building BB-43. Generally, the topography of the site slopes from north to south. The natural topography of the site has been modified by man-made features such as stormwater collection systems, concrete and paved parking lots, and various

structures which interfere with the drainage and infiltration of stormwater. Based on the USGS topographical map for the Camp Lejeune Quadrangle, the flood boundary and floodway map for Onslow County published by the Federal Emergency Management Agency and the site survey conducted as part of the Focused RI, the site is not within the 100-year floodplain of the New River.

2.5.2 Site Geology

Based on soil borings that have been advanced at Site 91, the soil conditions are generally uniform throughout the study area. Typically, the shallow soils consist of unconsolidated deposits of multicolored sand and silty sands with intermixed clay and silt lenses. These soils represent the Quaternary age "undifferentiated" deposits which overlay the Belgrade and River Bend Formations. Sands are medium to fine grained and contained varied amounts of silt and clay.

Underlying soils are dense, greenish-gray, fine silt containing varying amounts of sand, clay and shell fragments. This soil unit constitutes the Belgrade Formation typically referred to as the semi-confining unit separating the surficial and Castle Hayne aquifers.

2.5.3 Site Hydrogeology

Hydrogeologic characteristics in the vicinity of the site were evaluated by reviewing existing information and installing a network of shallow monitoring wells across the site. Although Catlin had installed three wells (IR91-MW16, IR91-MW17 and IR91-MW18) in the Castle Hayne aquifer during an UST investigation, the linear positioning of the wells does not allow for an accurate analysis of the aquifer.

Groundwater was encountered at varying depths during the drilling program. The variation was attributed to topographical changes and variations in the elevation of the water table. In general, the groundwater was encountered between 8 and 11 feet bgs during field activities.

A single round of groundwater measurements were collected during the field program on April 26, 1997. Groundwater elevations, flow patterns and gradient calculations are illustrated on Figure 5. The data indicates that groundwater located at the site flows south at a estimated average gradient of 1.1×10^{-2} ft/ft. The structures located at the site have caused some minor deflection in the groundwater contour lines (as noted on the western portion of Figure 91-2), however, it appears that groundwater is essentially undisturbed by these structures.

2.5.4 Identification of Water Supply Wells

Figure 91-3 identifies the location of the water supply wells within a one-mile radius of Site 91. The locations and descriptions of the five active wells (BB44, BB47, BB218, BB220 and BB221) are the same as those mentioned for Site 90 (Section 1.5.4).

2.5.5 Nature and Extent of Contamination

2.5.5.1 Three Well Site Check

The three well site check included the installation of three monitoring wells (91-MW01 through 91-MW03) around the former UST basin. These wells were installed to a depth of approximately

20 feet bgs. Groundwater samples were collected from each well and analyzed for BTEX. Soil samples were collected from each of the well boreholes and were analyzed for TPH.

The results from this investigation indicated:

- Soil: TPH-total oil and grease concentrations ranging from 45,000 to 2,500,000 µg/kg. There were no detectable concentrations of TPH-gasoline, diesel, lubricating oil, mineral spirits, kerosene, or # 6 fuel oil reported.
- Groundwater: Maximum concentration of 0.5 µg/L of toluene within the groundwater. No free phase product was noted in any of the wells.

2.5.5.2 Leaking Underground Storage Tank CSA, Building BB-51

The CSA was conducted to determine site subsurface characteristics and determine the impact of petroleum releases associated with the former waste oil USTs. Ten HydroPunch™ penetrometers were installed to provide preliminary data. Groundwater samples collected via HydroPunch™ were analyzed for PAHs. Twelve shallow Type II monitoring wells (91-MW04 through 91-MW15) and three intermediate Type III (91-MW16 through 91-MW18) monitoring wells were installed to determine the horizontal and vertical extent of petrochemical contamination in the former UST basin. Soil samples were collected from selected boreholes and analyzed for oil and greae, TCLP organics and metals, flashpoint, purgeable aromatics, and soil pH. Groundwater samples collected from the newly installed monitoring wells were analyzed for PAHs, RCRA metals, and drinking water VOCs.

The results of the CSA indicated:

- No pattern of inorganic contamination in groundwater was established; however, chlorinated hydrocarbon, petroleum/fuel-related, and PAHs were identified in two plumes. The northern plume was roughly centered in the vicinity of shallow wells 91-MW06, 91-MW04, 91-MW07 and 91-MW15. The southern plume was roughly centered down gradient of the former UST basin in the vicinity of shallow monitoring wells 91-MW09, 91-MW08, 91-MW11, 91-MW12 and 91-MW14. The full vertical and horizontal extent of all organic contamination was not delineated by the CSA. Chloroform and benzene were the only organic compounds that exceeded established NCWQS.
- Total chlorinated hydrocarbons associated with the northern plume included chloroform, 1,1-dichloroethane and 1,2,4-trichlorobenzene. Total petroleum/fuel-related compounds associated with the northern plume includes toluene, m,p-xylenes, o-xylenes, isopropylbenzene, 1,3,5-trimethylbenzene and 1,2,4-trimethylbenzene (isopropylbenzene, 1,3,5-trimethylbenzene, and 1,2,4-trimethylbenzene may be components of fuel or solvents). PAHs associated with the northern plume included fluorene, pyrene, indeno(1,2,3-cd)pyrene, and naphthalene.

The northern plume appeared to be centered around monitoring well BB51-15 (91-MW15). Concentration ranges associated with the northern plume are noted below and include levels from shallow and intermediate wells.

| | |
|--|-----------------------|
| Total Chlorinated Hydrocarbons | 2.4 µg/L to 3.4 µg/L |
| Total petroleum/fuel-related compounds | 3.1 µg/L to 39.2 µg/L |
| Total PAHs | 3.6 µg/L to 39.4 µg/L |

- Total chlorinated hydrocarbons associated with the southern plume included chloroform, 1,1,1-trichloroethane, bromochloromethane, and 1,1-dichloroethane. Total petroleum/fuel-related compounds associated with the southern plume included benzene, toluene, ethylbenzene, m,p,o-xylenes, 1,3,5-trimethylbenzene, and 1,2,4-trimethylbenzene. PAHs associated with the southern plume included naphthalene, fluorene, pyrene, and indeno(1,2,3-cd)pyrene and phenanthrene.

The southern plume appeared to be centered around monitoring well BB51-8 (91-MW08). Concentration ranges near the center of the southern plume are noted below.

| | |
|--|-----------------------|
| Total Chlorinated Hydrocarbons | 6.7 µg/L to 11.5 µg/L |
| Total petroleum/fuel-related compounds | 13.8 µg/L to 42 µg/L |
| Total PAHs | 2.4 µg/L to 36 µg/L |

- Organic compounds were detected in soil samples collected from all six borings, and oil and grease were identified in two areas. Organics consisted primarily of chlorinated ethenes and ethanes and petroleum/fuel-related compounds. Oil and grease was in the vicinity of the former UST basin and in an area adjacent to 91-MW16. The area of highest organic levels were in the vicinity of monitoring wells 91-MW11, 91-MW12, and 91-MW14. This area is south of the former UST basin.
- In the soil samples, total petroleum/fuel-related compounds identified in the CSA consisted of benzene, toluene, ethylbenzene, xylenes, and 1,2,4 trimethylbenzene. Chlorinated hydrocarbons consisted principally of eight chlorinated ethenes and ethanes (1,1-dichloroethene, trans 1,2-dichloroethene, 1,1-dichloroethane, 1,1,1-trichloroethane, TCE 1,1,2-trichloroethane, 1,1,1,2-tetrachloroethane and 1,1,2,2-tetrachloroethane).
- The highest concentration of total petroleum/fuel-related compounds was observed in soil boring 91-MW11 (17.8 µg/kg at 24 feet bgs) which is located approximately 100 feet southeast of the former UST basin. Concentrations in the remaining samples were less than 10 µg/kg.
- The location with the highest level of chlorinated hydrocarbons was soil boring 91-M11 (14.5 µg/kg at a depth of 24 feet bgs). Samples collected from the remaining locations had concentrations of less than 6 µg/kg.
- Oil and grease were identified in all but three of the soil boring samples analyzed (91-MW12, 91-MW14, and 91-MW15); however, only two of the concentrations reported were above state regulatory levels. Sample 91-MW12 (10 to 12 feet bgs) and 91-MW16 (2.5 to 5 feet bgs) had detections of 460,000 µg/kg and 430,000 µg/kg, respectively.

2.5.5.3 Focused RI

A field investigation at Site 91 was conducted from April through May 1997 to gather data necessary to determine the horizontal and vertical extent of soil contamination identified in previous investigations, and if groundwater contamination had migrated horizontally and vertically. The field investigation included a soil investigation, a groundwater investigation, a site survey, and IDW.

Findings of the Focused RI

This section presents the conclusions derived from data collected during the Focused RI conducted at Site 91.

Subsurface Soils

- No VOCs were detected in soil samples submitted to the mobile laboratory.
- Acetone was detected in the three confirmatory samples submitted to the fixed-base laboratory. Although the origin of the acetone is uncertain, it is believed these detections are not site-related (as mentioned for Site 90).
- Although not detected in the mobile laboratory, toluene was detected in two of the three confirmatory samples submitted to the fixed-base laboratory. The source of this compound is uncertain. The location of the soil boring that exhibited the toluene detection (91-TWSB05) is adjacent to a concrete pad that is used for the temporary storage of hazardous and potentially hazardous materials. It is believed that concentration of the toluene in this sample (21 µg/kg) is not indicative of a substantial spill or release.
- One SVOC, bis(2-ethylhexyl)phthalate, was detected in two confirmatory samples that were submitted to the fixed-base laboratory. These detections are not considered to be site-related.
- A total of 18 metals were detected in soil samples submitted to the fixed-base laboratory. The detected inorganics are considered to be naturally occurring and were within the range of the base background levels.
- Generally the subsurface soil data gathered during the Focused RI did not confirm the presence of soil contamination detected during the CSA. A total of 29 VOCs were identified in soil samples collected during the CSA. The CSA identified five VOCs (1,1-dichloroethene, toluene, 1,2,4-trimethylbenzene, xylenes, and isopropyl benzene) as prevalent compounds. These compounds appeared to be concentrated in the south and central portion of the site in the vicinity of IR90-MW11, IR90-MW14, and IR90-MW15. A total of two VOCs, acetone and toluene, were detected in soils collected from during the Focused RI.

The results of the sample analysis from the fixed base laboratory appear in Table 91-1.

Groundwater

- PCE was detected in two samples submitted to the mobile laboratory at levels of 0.1 and 0.6 µg/L. These levels are below the Federal MCL (5 µg/L) and the NCWQS (0.7 µg/L). Chlorinated hydrocarbons were detected during previous investigations and are potentially site-related.
- Chloroform was detected by the mobile laboratory in groundwater samples collected from all nine temporary wells and 11 of 17 the permanent wells. Chloroform was detected in one of nine confirmatory samples that were submitted to the fixed-base laboratory. The detection was exhibited by a sample collected from a temporary well. These detections are most likely, associated with the chlorinated potable water used during field decontamination procedures not site-related.
- A single SVOC, bis(2-ethylhexyl)phthalate, was detected in five of the nine confirmatory samples that were submitted to the fixed-base laboratory. The concentrations in samples collected from monitoring wells were less than ten times the concentration detected in the field blanks. No other organic compounds were detected in the confirmatory sample submitted to the fixed-base laboratory.
- A total of 19 inorganics were detected in the confirmatory samples submitted to the fixed-base laboratory. The concentrations of iron and manganese detected in confirmatory samples exceeded Federal MCLs and NCWQS. However, concentrations of these inorganics were within the range of base background levels.
- With the exception of chloroform detections, the groundwater data gathered during the Focused RI is generally inconsistent with the groundwater data gathered during the CSA. The following is a general comparison of results from the CSA and the Focused RI:
 - ▶ During the CSA a total of 17 VOCs were detected. One or more of these VOCs were detected in all 13 permanent monitoring wells that were sampled. Four VOCs, chloroform, 1,1-dichloroethene, 1,2,4-trimethyl-benzene and toluene were described by the CSA as prevalent compounds. Chloroform was detected site-wide but the remaining three prevalent compounds were primarily concentrated in the south and southwest. During the Focused RI a total two VOCs, chloroform and PCE, were detected. Chloroform was detected in 11 of the 13 existing permanent monitoring wells and in all nine of the temporary wells. Tetrachlorethene was detected in one temporary and one permanent monitoring located in the northern portion of the site. No detections of 1,1-dichloroethene, or 1,2,4-trimethylbenzene were encountered during the Focused RI.
 - ▶ During the CSA a total of four SVOCs were detected. One or more of these SVOCs were detected in all 13 permanent monitoring wells that were sampled. None of these SVOCs were detected during the Focused RI of the temporary wells.

The results of the sample analysis from the mobile and fixed base laboratories appear in Tables 91-2 and 91-3.

2.6 Summary of Site Risks

A qualitative risk assessment for Site 91 was conducted based on data generated during the sampling and analytical phase of the Focused RI. The risk assessment evaluated the projected impact of COPCs on human health and/or the environment, and employed a similar approach as described for Site 90 (Section 1.6).

2.6.1 Subsurface Soil COPCs

Mobile Laboratory

Five subsurface soil samples were analyzed for VOCs only by the mobile laboratory. There were no VOCs detected in the Site 91 subsurface soil samples. Therefore, no VOCs were retained as COPCs for subsurface soil analyzed by the mobile laboratory.

Fixed Base Laboratory

Three subsurface soil samples were analyzed at the fixed base laboratory for VOCs. Acetone and toluene were detected at maximum concentrations less than their respective residential soil RBCs and SSLs. Therefore, these VOCs were not retained as COPCs.

Three subsurface soil samples were analyzed for SVOCs. Bis(2-ethylhexyl)phthalate was detected at a concentration less than its residential soil RBC and SSL. Therefore, it was not retained as a COPC.

Three subsurface soil samples were analyzed for pesticides/PCBs. There were no pesticides or PCBs detected in the subsurface soil at Site 91. Therefore, no pesticides or PCBs were retained as subsurface soil COPCs.

Three subsurface soil samples were analyzed for inorganics. Antimony, barium, beryllium, cadmium, chromium, cobalt, copper, manganese, nickel, vanadium, and zinc were detected at maximum concentrations less than their respective residential soil RBCs and SSLs. Lead was detected in 3 of 3 samples at a maximum concentration of 4.3 mg/kg, which is less than the USEPA lead action level for soil of 400 mg/kg. Therefore, these inorganics were not retained as COPCs. Aluminum was detected in two out of three samples, one of which had a maximum concentration greater than its residential soil RBC. Iron was detected in three samples at concentrations that exceeded the SSL.

In summary, aluminum and iron were retained as COPCs for Site 91 subsurface soil.

2.6.2 Groundwater COPCs

Mobile Laboratory

Twenty-six groundwater samples were analyzed for VOCs only by the mobile laboratory. PCE was detected in two out of twenty-six samples at a concentration less than its tap water RBC. Therefore, it was not retained as a COPC. Chloroform was detected in twenty out of twenty-six samples at concentrations exceeding its tap water RBC, and was therefore retained as a groundwater COPC.

Fixed Base Laboratory

Nine groundwater samples were analyzed for VOCs by the fixed base laboratory. One VOC, chloroform, was detected in one of nine samples at a concentration that exceeded its tap water RBC. Therefore, chloroform was retained as a groundwater COPC.

Nine groundwater samples were analyzed for SVOCs. Bis(2-ethylhexyl)phthalate was detected in five out of nine samples at a maximum detected concentration that exceeded its tap water RBC. Bis(2-ethylhexyl)phthalate was detected in blanks at a maximum concentration of 10 µg/L. Because the sample concentration (49 µg/L) is less than the comparison concentration in blanks, bis(2-ethylhexyl)phthalate was not retained as a COPC.

Nine groundwater samples were analyzed for pesticides/PCBs. There were no pesticides or PCBs detected in the groundwater samples. Thus, no pesticides or PCBs were retained as groundwater COPCs.

Nine groundwater samples were analyzed for inorganics. The following inorganics were not retained as COPCs because they were detected at concentrations less than their respective tap water RBCs: aluminum, barium, cadmium, chromium, cobalt, copper, nickel, selenium, silver, vanadium, and zinc. Lead was detected in two out of nine groundwater samples at concentrations less than the lead action level. Therefore, lead was not retained as a COPC.

Arsenic, iron, and manganese were detected at maximum concentrations that exceeded their respective tap water RBCs. Therefore, these inorganics were retained as groundwater COPCs.

In summary, the following compound and analytes were retained as groundwater COPCs for Site 91: chloroform, arsenic, iron, and manganese.

2.6.3 Summary of Risk Assessment Results

- Iron was detected in three out of three subsurface soil samples analyzed by the fixed base laboratory which exceeded the SSL. However, iron is a naturally occurring element in soil, and concentrations were within background concentrations. In addition, iron is considered an essential nutrient.
- Aluminum was detected in two out of three subsurface soil samples analyzed by the fixed base laboratory. One of the detected concentrations exceeded the residential soil RBC. In addition, the detected concentrations of aluminum were within base background levels, so it is unlikely that the presence of aluminum is site-related.
- Chloroform was detected in twenty out of twenty-six groundwater samples analyzed by the mobile laboratory and one out of nine groundwater samples analyzed by the fixed base laboratory. All positively detected concentrations of chloroform exceeded the RBC and NCWQS. Chloroform is associated with the chlorination process in the treatment of potable water. Potable water from the Base was used for decontaminating field equipment and, therefore, may have impacted sample results, accordingly, it is unlikely that the presence of this compound is site-related.

- Arsenic was detected in three out of nine groundwater samples analyzed by the fixed base laboratory at concentrations that exceeded its tap water RBC. The concentrations did not exceed the NCWQS and were within the range of base background levels of arsenic found at Camp Lejeune.
- Iron was detected in five out of nine groundwater samples analyzed by the fixed base laboratory at a maximum detected concentration that exceeded the tap water RBC and NCWQS (see the discussion on iron for Site 90, Section 1.6.2).
- Manganese was detected in all groundwater samples analyzed by the fixed base laboratory at a maximum detected concentration that exceeded the RBC and NCWQS. Manganese concentrations were within the range of base background levels of manganese found at Camp Lejeune.

Aluminum and iron were retained as subsurface soil COPCs at Site 91. However, these constituents are naturally occurring, were within background concentrations, and are not considered to be site-related.

Chloroform, arsenic, iron, and manganese were retained as groundwater COPCs for Site 91. Chloroform was detected in samples analyzed by both the mobile and fixed base laboratories that exceeded screening criteria. Chloroform is not considered to be site-related. Arsenic, iron, and manganese were also detected in the samples analyzed by the fixed base laboratory that exceeded screening values. Although iron was retained as a groundwater COPC, it is still considered an essential nutrient.

A summary of COPCs for Site 91 appears in Table 91 -4.

2.7 Follow Up Investigations

In order to verify the presence or absence of constituents that were identified as COPCs during the Focused RI, additional studies were completed. The results of these studies are presented in the following paragraphs.

2.7.1 Supplemental Groundwater Investigation

The Supplemental Groundwater Investigation at Site 91 was developed to gather data necessary to determine if contaminants such as chloroform and bis(2-ethylhexyl)phthalate detected during the first phase of the Focused RI are site-related. Sampling was also conducted to confirm detected levels of PCE.

To gather this information, existing monitoring wells at Site 91 containing these constituents were resampled at the request of NC DENR. The request by NC DENR came in the form of a comment on the Draft Focused RI. Monitoring wells IR91-MW01, -MW03, -MW04, -MW05, -MW06, -MW08, -MW09, -MW11, -MW13, -MW15, -MW16IW, and -MW17IW were proposed for sample collection in response to NC DENR's comments. The samples were collected between November 1 and 3, 1999 and analyzed for VOCs and SVOCs.

Findings of the Supplemental Groundwater Investigation.

- Methylene Chloride was detected in all samples from Site 91. The highest concentration was 6.0 µg/L in 91MW0599D and 91MW0899D. Groundwater samples 91MW0599D and 91MW0899D contained a concentration of methylene chloride in excess of NCWQS (5 µg/L) and USEPA Region III RBC (4.1 µg/L). However, methylene chloride was detected in a field blank sample at a concentration of 8.0 µg/L. The detected concentrations of methylene chloride did not exceed ten times the maximum concentration detected in any blank. As a result of the detections in field blank samples and internal laboratory blanks, methylene chloride is not considered a site related contaminant.
- Acetone was detected in all groundwater samples collected from Site 91 except for sample 91MW0699D. The maximum detected concentrations of acetone at Site 91 was 6.0 µg/L in groundwater sample 91MW0199D. This concentrations did not exceed any of the three comparison criteria standards. Acetone was detected in QA/QC blank samples (field and laboratory) ranging in concentration from 3.0 µg/L to 29.0 µg/L. The highest concentration was detected in the laboratory method blank. Acetone concentrations detected in the groundwater samples collected from the site did not exceed ten times the maximum concentration detected in any blank. Like methylene chloride, acetone is not considered to be a site related contaminant.
- 2-Butanone was detected in groundwater sample 91MW0399D. The detected concentration did not exceed the NCWQS or the Region III RBC for 2-butanone. Federal MCLs have not been established for 2-butanone. 2-Butanone is a typical laboratory contaminant and was detected in a laboratory method blank at a concentration of 6.0 µg/L. The contaminant was not detected in any groundwater sample at concentrations that exceeded ten times the maximum concentration detected in any blank. Due to detections in the blank samples and its documented occurrence as a common laboratory artifact, it is suspected that detections of 2-butanone is not site related but rather a laboratory artifact.
- Chloroform was detected in groundwater samples 91MW0599D and 91MW1399D. The detected concentration of chloroform exceeds the NCWQS of 0.19 µg/L and the RBC of 0.15 µg/L, but does not exceed the Federal MCL of 100 µg/L. Chloroform was not detected in any of the blanks; therefore, it is considered to be site-related for Site 91. Chloroform was detected in 20 groundwater samples collected from Site 91 during the Focused RI. Eleven of the 20 groundwater samples containing chloroform were collected from monitoring wells that were resampled during this phase of groundwater sample collection.
- A total of five SVOCs were detected in groundwater samples collected from Site 91. Bis(2-ethylhexyl)phthalate was detected in several of the samples and in a laboratory method blank at a concentration of 2.0 µg/L. Bis(2-ethylhexyl)phthalate was detected in groundwater samples 91MW0399D, 91MW0899D, 91MW0999D, 91MW1199D and 91MW1799D. All samples in which bis(2-ethylhexyl)phthalate was detected exceeded both the NCWQS (3.0 µg/L) and the RBC (4.8 µg/L) for the compound. Several detected concentrations of bis(2-ethylhexyl)phthalate did not exceed ten times the concentration detected in the blank and were considered a

laboratory artifact. These results were dismissed from further consideration as a site-related contaminant.

- The remaining samples (91MW0899D and 91MW0999D) had concentrations of bis(2-ethylhexyl)phthalate exceeding ten times the blank concentration. Bis(2-ethylhexyl)phthalate is used as a plasticizer for many products including polyvinyl chloride (PVC) resins. It is likely that one of the many products used in the collection and/or analysis of the samples may have introduced this contaminant to the groundwater samples.
- The other four SVOCs were detected in sample 91MW16DUP99D. These SVOCs are 1,3-dichlorobenzene, 1,4-dichlorobenzene, 1,2-dichlorobenzene, and 1,2,4-trichlorobenzene. Only 1,4-dichlorobenzene exceeded the USEPA Region III RBC.

The results of the sample analysis appear on Table 91-5.

2.7.2 Post-RI Monitoring

Because some detections exceeded screening criteria during the Supplemental Groundwater Investigation, eight monitoring wells were selected for quarterly sampling from July 2000 to April 2001. These wells are 91-MW06, 91-MW08, 91-MW09, 91-MW10, 91-MW12, 91-MW13, 91-MW16IW, and 91-MW17IW. A ninth well, 91-MW05, was added to the program in October 2000. Samples were collected and analyzed for VOCs, SVOCs, iron, and arsenic. The results from these sampling events are presented in detail in the Long-Term Monitoring Report for OU No. 17 and presented on Table 91-6.

Findings of the Post-RI Monitoring

As shown on Table 91-6, chloroform was detected in two wells over the course of four sampling events. In 91-MW05, it was detected in October 2000, but not in the following two quarters. 91-MW13 had a detection of chloroform in July 2000, but not in the three following quarters. Both of these detections exceeded the NCWQS and Region III Tapwater RBCs.

Pyrene was detected in 91-MW05 in October 2000 at concentrations less than the Region III Tapwater RBC. Pyrene was not detected in three later sampling events.

Arsenic was detected in 91-MW12 for four consecutive quarters. Arsenic was not detected in any samples collected from the other monitoring wells. These arsenic concentrations are within the range of base background concentrations and are not considered to be site-related. Iron has been detected at all nine wells that are in the sampling program. Twenty-two of the thirty-five detections over all the quarters were below the NCWQS. Four consecutive samples collected from 91-MW12 exceeded the Region III Tapwater RBC for iron. All other detections of iron in the other wells were below this level.

2.8 Summary of Site Conditions

Five environmental investigations have been conducted at Site 91: the Three Well Site Check, the CSA, the Focused RI, the Supplemental Groundwater Investigation, and Post-RI Monitoring. From these studies, it has been concluded that there are no site-related constituents found at Site 91. The constituents that have been detected in the latest Post-RI sampling events are naturally occurring and not site-related.

2.9 Current and Potential Future Site and Resource Uses

Site 91 is currently used by the Marine Corps School of Engineering to train personnel in the operation and maintenance of heavy construction equipment. Approximately 25% of the study area is wooded and the remaining 75% is actively used by the School of Engineering. Active areas at the site include equipment service and repair, administrative offices, vehicle storage, temporary storage of hazardous and potentially hazardous materials, equipment wash pad, and oil and lubricant drum storage areas. This land use is unlikely to change in the immediate future.

As discussed in the previous section, five active groundwater supply wells are located within a one-mile radius of the site. These supply wells will likely remain active in the immediate future.

2.10 Explanation of Significant Changes

The PRAP presents the selected remedy as the preferred alternative for Site 91. No significant changes to the remedy have been made.



Baker Environmental, Inc.

TABLES

TABLE 91-1
SUMMARY OF FOCUSED RI DATA
ORGANICS AND INORGANICS IN SUBSURFACE SOIL
FIXED BASE LABORATORY
OPERABLE UNIT NO. 17 (SITE 91)
MCB, CAMP LEJEUNE, NORTH CAROLINA
RECORD OF DECISION
CTO-0344

| Constituent | Range/Frequency | | Comparison to Criteria | | | | | | COPC Selection ⁽²⁾ |
|-------------------------------|------------------------------|---|---|--|-----------------------|--|--------------------|------------------------------------|-------------------------------|
| | Range of Positive Detections | No. of Positive Detects/ No. of Samples | Twice the Average Base Specific Background ⁽¹⁾ Concentration | No. of Times Exceeded Twice the Average Background Concentration | Residential RBC Value | Positive Detects Above Residential RBC Value | North Carolina SSL | Positive Detects Above NCSSL Value | |
| Volatiles (µg/kg): | | | | | | | | | |
| Acetone | 25 - 2,800 | 3/3 | NA | NA | 780,000 | 0 | 2,810 | 0 | No |
| Toluene | 21 | 1/3 | NA | NA | 1,600,000 | 0 | 7,270 | 0 | No |
| Semivolatiles (µg/kg): | | | | | | | | | |
| Bis(2-ethylhexyl)phthalate | 82J - 430J | 2/3 | NA | NA | 46,000 | 0 | 6,670 | 0 | No |
| Inorganics (mg/kg): | | | | | | | | | |
| Aluminum | 3,990J - 8,250J | 2/3 | 7,375.3 | 1 | 7,800 | 1 | -- | NA | Yes |
| Antimony | 0.42J | 1/3 | 6.4 | 0 | 3.1 | 0 | 5.42 | 0 | No |
| Barium | 6J - 12.4J | 3/3 | 14.2 | 0 | 550 | 0 | 848 | 0 | No |
| Beryllium | 0.03J - 0.07J | 3/3 | 0.19 | 0 | 16 | 0 | 3.38 | 0 | No |
| Cadmium | 0.04J | 1/3 | 0.71 | 0 | 3.9 | 0 | 2.72 | 0 | No |
| Calcium | 261J - 439J | 3/3 | 391.5 | 2 | NE | NA | -- | NA | No |
| Chromium | 4.9J - 10.5J | 3/3 | 12.6 | 0 | 23 | 0 | 27.2 | 0 | No |
| Cobalt | 0.22 - 0.31J | 3/3 | 1.5 | 0 | 160 | 0 | -- | NA | No |
| Copper | 0.25J - 0.64J | 2/3 | 2.4 | 0 | 310 | 0 | 704 | NA | No |
| Iron | 1,030J 0 - 1,930J | 3/3 | 7,252.1 | 0 | 2,300 | 0 | 151 | 3 | Yes |
| Lead | 2.7J - 4.3J | 3/3 | 8.3 | 0 | 400 ⁽³⁾ | 0 | 270 | NA | No |
| Magnesium | 174J - 472J | 3/3 | 260.7 | 2 | NE | NA | -- | NA | No |
| Manganese | 5.3 - 6.2 | 3/3 | 7.9 | 0 | 160 | 0 | 65.2 | NA | No |
| Nickel | 0.47J - 0.74J | 3/3 | 3.7 | 0 | 160 | 0 | 56.4 | 0 | No |
| Potassium | 207J - 300J | 3/3 | 347.2 | 0 | NE | NA | -- | NA | No |

TABLE 91-1 (continued)
SUMMARY OF FOCUSED RI DATA
ORGANICS AND INORGANICS IN SUBSURFACE SOIL
FIXED BASE LABORATORY
OPERABLE UNIT NO. 17 (SITE 91)
MCB, CAMP LEJEUNE, NORTH CAROLINA
RECORD OF DECISION
CTO-0344

| Constituent | Range/Frequency | | Comparison to Criteria | | | | | | COPC Selection ⁽²⁾ |
|-------------|------------------------------|---|---|--|-----------------------|--|--------------------|------------------------------------|-------------------------------|
| | Range of Positive Detections | No. of Positive Detects/ No. of Samples | Twice the Average Base Specific Background ⁽¹⁾ Concentration | No. of Times Exceeded Twice the Average Background Concentration | Residential RBC Value | Positive Detects Above Residential RBC Value | North Carolina SSL | Positive Detects Above NCSSL Value | |
| Sodium | 30.9J - 52.5J | 2/3 | 52.7 | 0 | NE | NA | -- | NA | No |
| Vanadium | 4.1J - 10.9 | 3/3 | 13.5 | 0 | 55 | 0 | -- | 0 | No |
| Zinc | 1.7J - 3.2J | 3/3 | 6.7 | 0 | 2,300 | 0 | 1,100 | 0 | No |

Notes:

⁽¹⁾ Soil background concentrations are based on reference background soil samples collected from MCB Camp Lejeune investigations.

⁽²⁾ COPC -Chemical of Potential Concern for human health risk assessment (yes/no).

⁽³⁾ Action Level for residential soils (USEPA, 1994)

NE = Not established

NA = Not applicable

J = Estimated Value

-- = SSL not established.

TABLE 91-2

SUMMARY OF FOCUSED RI DATA
VOLATILE ORGANICS IN GROUNDWATER
MOBILE LABORATORY
OPERABLE UNIT NO. 17 (SITE 91)
MCB, CAMP LEJEUNE, NORTH CAROLINA
RECORD OF DECISION
CTO-0344

| Parameter | Groundwater Criteria | | | Frequency/Range | | Comparison to Criteria | | | COPC Selection ⁽³⁾ |
|-------------------|--------------------------------|--|--|---|----------------------------------|---------------------------------------|---|---|-------------------------------|
| | NCWQS ⁽¹⁾ (µg/L) | Maximum Base Background Concentration ⁽²⁾ | Region III Tap Water RBC Value (µg/L) | No. of Positive Detects/ No. of Samples | Concentration Range (µg/L) | Positive Detects Above NCWQS | Positive Detects Above Base Background concentration | Positive Detects Above RBC Value | |
| Chloroform | 0.19 | NE | 0.15 | 20/26 | 0.2 - 15.1 | 20 | NA | 20 | Yes |
| Tetrachloroethene | 0.7 | NE | 1.1 | 2/26 | 0.1 - 0.6 | 0 | NA | 0 | No |

Notes:

- ⁽¹⁾ NCWQS = North Carolina Water Quality Standards for Groundwater (October, 2000).
⁽²⁾ There are no base background concentrations established for organic contaminants in groundwater.
⁽³⁾ COPC = Chemical of potential concern for human health risk assessment (yes/no).

NA = Not Applicable
NE = Not Established

TABLE 91-3

**SUMMARY OF FOCUSED RI DATA
ORGANICS AND METALS IN GROUNDWATER
FIXED BASE LABORATORY
OPERABLE UNIT NO. 17 (SITE 91)
MCB, CAMP LEJEUNE, NORTH CAROLINA
RECORD OF DECISION
CTO-0344**

| Parameter | Groundwater Criteria | | | Frequency/Range | | Comparison to Criteria | | | COPC Selection ⁽³⁾ |
|----------------------------|--------------------------------|--|---------------------------------------|--|----------------------------|------------------------------|--|----------------------------------|-------------------------------|
| | NCWQS ⁽¹⁾ (µg/L) | Maximum Base Background Concentration ⁽²⁾ | Region III Tap Water RBC Value (µg/L) | No. of Positive Detects/ No. of Samples | Concentration Range (µg/L) | Positive Detects Above NCWQS | Positive Detects Above Maximum Base Background Concentration | Positive Detects Above RBC Value | |
| Volatiles | | | | | | | | | |
| Chloroform | 0.19 | NE | 0.15 | 1/9 | 2J | 1 | NA | 1 | Yes |
| Semivolatiles | | | | | | | | | |
| Bis(2-ethylhexyl)phthalate | 3 | NE | 4.8 | 5/9 | 4J - 49 | 5 | NA | 4 | No ⁽⁴⁾ |
| Metals | | | | | | | | | |
| Aluminum | NE | NR | 3,700 | 6/9 | 43.1J - 2,410 | NA | NA | 0 | No |
| Arsenic | 50 | 570 | 0.045 | 3/9 | 2.7J - 12.1 | 0 | 0 | 3 | Yes |
| Barium | 2,000 | 5,410 | 260 | 8/9 | 27.7J - 69.7J | 0 | 0 | 0 | No |
| Cadmium | 5 | 110 | 1.8 | 1/9 | 0.3J | 0 | 0 | 0 | No |
| Calcium | NE | 828,000 | NE | 8/9 | 3,040J - 57,900 | NA | 0 | NA | No |
| Chromium | 50 | 895 | 11 | 4/9 | 0.67J - 4.2J | 0 | 0 | 0 | No |
| Cobalt | NE | NR | 220 | 3/9 | 0.94J - 3.5J | NA | NA | 0 | No |
| Copper | 1,000 | 1,030 | 150 | 1/9 | 1.9J | 0 | 0 | 0 | No |
| Iron | 300 | NR | 1,100 | 5/9 | 171 - 15,000 | 4 | NA | 3 | Yes |
| Lead | 15 | 9,340 | NE | 2/9 | 1.7J - 2.1J | 0 | 0 | NA | No |
| Magnesium | NE | NR | NE | 9/9 | 1,010J - 10,400 | NA | NA | NA | No |
| Manganese | 50 | 2,110 | 73 | 9/9 | 9.3J - 177 | 2 | 0 | 1 | Yes |
| Nickel | 100 | 486 | 73 | 6/9 | 0.81J - 6.1J | 0 | 0 | 0 | No |
| Potassium | NE | NR | NE | 9/9 | 965J - 1,680J | NA | NA | NA | No |
| Selenium | 50 | NR | 18 | 2/9 | 2.8J - 4.9J | 0 | NA | 0 | No |
| Silver | 18 | NR | 18 | 4/9 | 0.33J - 0.58J | 0 | NA | 0 | No |
| Sodium | NE | 156,000 | NE | 9/9 | 7,170 - 13,900 | NA | 0 | NA | No |

TABLE 91-3 (continued)

**SUMMARY OF FOCUSED RI DATA
ORGANICS AND METALS IN GROUNDWATER
FIXED BASE LABORATORY
OPERABLE UNIT NO. 17 (SITE 91)
MCB, CAMP LEJEUNE, NORTH CAROLINA
RECORD OF DECISION
CTO-0344**

| Parameter | Groundwater Criteria | | | Frequency/Range | | Comparison to Criteria | | | COPC Selection ⁽³⁾ |
|-----------|--------------------------------|--|---------------------------------------|--|----------------------------|------------------------------|--|----------------------------------|-------------------------------|
| | NCWQS ⁽¹⁾ (µg/L) | Maximum Base Background Concentration ⁽²⁾ | Region III Tap Water RBC Value (µg/L) | No. of Positive Detects/ No. of Samples | Concentration Range (µg/L) | Positive Detects Above NCWQS | Positive Detects Above Maximum Base Background Concentration | Positive Detects Above RBC Value | |
| Vanadium | NE | 1,700 | 26 | 2/9 | 3.0J - 3.4J | NA | 0 | 0 | No |
| Zinc | 2,100 | 12,100 | 1,100 | 8/9 | 0.83J - 12.2J | 0 | 0 | 0 | No |

Notes:

⁽¹⁾ NCWQS = North Carolina Water Quality Standards for Groundwater (October, 2000).

⁽²⁾ There are no base background concentrations.

⁽³⁾ COPC = Chemical of potential concern for human health risk assessment (yes/no).

⁽⁴⁾ Not retained as a COPC due to blank contamination.

NE - Not Established.

NA - Not Applicable.

NR - Not Recorded in Table 1 of the draft version of the Evaluation of Metals in Groundwater (Baker, 1994).

J - Estimated Value.

TABLE 91-4

**CONTAMINANTS OF POTENTIAL CONCERN
EVALUATED IN THE QUALITATIVE RISK ASSESSMENT
OPERABLE UNIT NO. 17 (SITE 91)
MCB, CAMP LEJEUNE, NORTH CAROLINA
RECORD OF DECISION
CTO-0344**

| Contaminant | Subsurface Soil | Groundwater |
|---------------------------------|------------------|---------------------|
| Volatiles: Chloroform | | X ⁽¹⁾⁽²⁾ |
| Inorganics: Aluminum | X ⁽¹⁾ | |
| Arsenic | | X ⁽²⁾ |
| Iron | X ⁽²⁾ | X ⁽²⁾ |
| Manganese | | X ⁽²⁾ |

Notes:

- (1) Selection as a COPC based on mobile laboratory data.
- (2) Selection as a COPC based on fixed base laboratory data.

TABLE 91-5

**POSITIVE DETECTION SUMMARY OF THE SUPPLEMENTAL GROUNDWATER INVESTIGATION
OPERABLE UNIT NO. 17 (SITE 91)
MCB, CAMP LEJEUNE, NORTH CAROLINA
CTO-0344**

| SAMPLE ID SAMPLE DATE | North Carolina Water Quality 2L Standards (ug/l) | USEPA Region III Risk Based Concentrations RBCs (ug/l) | 91MW0199D 11/2/99 | 91MW0399D 11/2/99 | 91MW0599D 11/3/99 | 91MW0699D 11/2/99 | 91MW0899D 11/3/99 | 91MW0999D 11/3/99 | 91MW1199D 11/2/99 |
|-----------------------------|---|--|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|
| VOLATILES (µg/l) | | | | | | | | | |
| Methylene chloride | 5 | 4.1 | 2 J | 2 JB | <u>6</u> JB | 1 JB | <u>6</u> JB | 4 JB | 2 J |
| Acetone | 700 | 610 | 6 JB | 5 JB | 3 JB | ND | 4 JB | 3 JB | 4 JB |
| Chloroform | 0.19 | 0.15 | ND | ND | <u>2</u> J | ND | ND | ND | ND |
| 2-Butanone | 170 | 1,900 | ND | 5 JB | ND | ND | ND | ND | ND |
| SEMIVOLATILES (µg/l) | | | | | | | | | |
| 1,3-Dichlorobenzene | 620 | 5.5 | ND | ND | ND | ND | ND | ND | ND |
| 1,4-Dichlorobenzene | 74 | 0.47 | ND | ND | ND | ND | ND | ND | ND |
| 1,2-Dichlorobenzene | 620 | 550 | ND | ND | ND | ND | ND | ND | ND |
| 1,2,4-Trichlorobenzene | NE | 190 | ND | ND | ND | ND | ND | ND | ND |
| bis(2-Ethylhexyl)phthalate | 3 | 4.8 | ND | <u>19</u> B | ND | ND | <u>22</u> | <u>24</u> B | <u>14</u> B |

NOTES:

- (1) NE = Standard was not established
- (2) µg/l = micrograms per liter
- (3) ND = Non detectable concentration. Concentration of compound is below method detection limit.
- (4) J = Estimated result
- (5) B = Compound was detected in laboratory blank.
- (6) Shading indicates concentration exceeded North Carolina Water Quality 2L Standard. 15 ANCAC **2L**
- (7) Underlining indicates concentration exceeded USEPA Region III Risk Based Concentrations (RBCs) for tapwater.

TABLE 91-5

**POSITIVE DETECTION SUMMARY OF THE SUPPLEMENTAL GROUNDWATER INVESTIGATION
OPERABLE UNIT NO. 17 (SITE 91)
MCB, CAMP LEJEUNE, NORTH CAROLINA
CTO-0344**

| SAMPLE ID SAMPLE DATE | North Carolina Water Quality 2L Standards (ug/l) | USEPA Region III Risk Based Concentrations RBCs (ug/l) | 91MW1399D 11/2/99 | 91MW1599D 11/2/99 | 91MW1699D 11/3/99 | 91MW16DUP99D 11/3/99 | 91MW1799D 11/2/99 | Number Exceeding North Carolina Water Quality Standards (ug/l) |
|-----------------------------|---|--|----------------------|----------------------|----------------------|-------------------------|----------------------|--|
| VOLATILES (ug/l) | | | | | | | | |
| Methylene chloride | 5 | 4.1 | 2 J | 3 J | 4 JB | 3 JB | 2 J | 2/12 |
| Acetone | 700 | 610 | 3 JB | 2 JB | 4 JB | 3 JB | 4 JB | 0/12 |
| Chloroform | 0.19 | 0.15 | 2 J | ND | ND | ND | ND | 2/12 |
| 2-Butanone | 170 | 1,900 | ND | ND | ND | ND | ND | 0/12 |
| SEMIVOLATILES (ug/l) | | | | | | | | |
| 1,3-Dichlorobenzene | 620 | 5.5 | ND | ND | ND | 5 J | ND | 0/12 |
| 1,4-Dichlorobenzene | 75 | 0.47 | ND | ND | ND | 6 J | ND | 0/12 |
| 1,2-Dichlorobenzene | 620 | 550 | ND | ND | ND | 2 J | ND | 0/12 |
| 1,2,4-Trichlorobenzene | NE | 190 | ND | ND | ND | 15 | ND | -- |
| bis(2-Ethylhexyl)phthalate | 3 | 4.8 | ND | ND | ND | ND | 14 | 5/12 |

TABLE 91-5
POSITIVE DETECTION SUMMARY OF SUPPLEMENTAL GROUNDWATER INVESTIGATION DATA
OPERABLE UNIT NO. 17 (SITE 91)
MCB, CAMP LEJEUNE, NORTH CAROLINA
CTO-0344

| SAMPLE ID SAMPLE DATE | North Carolina Water Quality 2L Standards (ug/l) | <u>USEPA Region III</u> <u>Risk Based</u> <u>Concentrations</u> <u>RBCs</u> (ug/l) | Number Exceeding USEPA Region III Risk Based Concentrations RBCs (ug/l) | LOCATION MAXIMUM DETECT |
|-----------------------------|---|--|--|-------------------------------|
| VOLATILES (µg/l) | | | | |
| Methylene chloride | 5 | 4.1 | 2/12 | 91MW0599D,91MW0899D |
| Acetone | 700 | 610 | 0/12 | 91MW0199D |
| Chloroform | 0.19 | 0.15 | 2/12 | 91MW0599D,91MW1399D |
| 2-Butanone | 170 | 1.900 | 0/12 | 91MW0399D |
| SEMIVOLATILES (µg/l) | | | | |
| 1,3-Dichlorobenzenc | 620 | 5.5 | 0/12 | 91MW16DUP99D |
| 1,4-Dichlorobenzene | 75 | 0.47 | 1/12 | 91MW16DUP99D |
| 1,2-Dichlorobenzene | 620 | 550 | 0/12 | 91MW16DUP99D |
| 1,2,4-Trichlorobenzene | NE | 190 | 0/12 | 91MW16DUP99D |
| bis(2-Ethylhexyl)phthalate | 3 | 4.8 | 5/12 | 91MW0999D |

TABLE 91-6

**POSITIVE DETECTION SUMMARY OF POST-RI MONITORING DATA
OPERABLE UNIT NO. 17 (SITE 91)
MCB, CAMP LEJEUNE, NORTH CAROLINA
CTO -0344**

| Detected Compounds | Comparison Criteria | | Concentration Range | | Location of Maximum Detection | Detection Frequency | Detected Above | |
|-------------------------|---------------------|-------|---------------------|---------|-------------------------------|---------------------|----------------|-----|
| | NCWQS | RBC | Min. | Max. | | | NCWQS | RBC |
| JULY 2000 | | | | | | | | |
| Volatiles (µg/L) | | | | | | | | |
| Chloroform | 0.19 | 0.15 | 4J | 4J | 91-MW13 | 1/8 | 1 | 1 |
| Semivolatiles (µg/L) | | | | | | | | |
| Bis(2-ethylhexyl)phthal | 3 | 4.8 | 5J | 9J | 91-MW16IW | 2/8 | 2 | 2 |
| Metals (µg/L) | | | | | | | | |
| Arsenic | 50 | 50 | 7.8B | 7.8B | 91-MW12 | 1/8 | 0 | 0 |
| Iron | 300 | 1,100 | 307 | 21500 | 91-MW12 | 5/8 | 5 | 1 |
| OCTOBER 2000 | | | | | | | | |
| Volatiles (µg/L) | | | | | | | | |
| Chloroform | 0.19 | 0.15 | 0.8 | 0.8 | 91-MW05 | 1/9 | 1 | 1 |
| Semivolatiles (µg/L) | | | | | | | | |
| Pyrene | NE | 18 | 3.6 | 4 | 91-MW05 | 1/9 | NA | 0 |
| Metals (µg/L) | | | | | | | | |
| Arsenic | 50 | 50 | 10.1 | 10.1 | 91-MW12 | 1/9 | 0 | 0 |
| Iron | 300 | 1,100 | 15.8B | 17800 | 91-MW12 | 8/9 | 6 | 1 |
| JANUARY 2001 | | | | | | | | |
| Volatiles (µg/L) | | | | | | | | |
| NONE DETECTED | | | | | | | | |
| Semivolatiles (µg/L) | | | | | | | | |
| NONE DETECTED | | | | | | | | |
| Metals (µg/L) | | | | | | | | |
| Arsenic | 50 | 50 | 8.0 | 8.0 | 91-MW12 | 1/9 | 0 | 0 |
| Iron | 300 | 1,100 | 20.0 | 18400.0 | 91-MW12 | 8/9 | 0 | 1 |
| APRIL 2001 | | | | | | | | |
| Volatiles (µg/L) | | | | | | | | |
| NONE DETECTED | | | | | | | | |
| Semivolatiles (µg/L) | | | | | | | | |
| NONE DETECTED | | | | | | | | |
| Metals (µg/L) | | | | | | | | |
| Arsenic | 50 | 50 | 2.6 | 11.8 | 91-MW12 | 6/9 | 0 | 0 |
| Iron | 300 | 1,100 | 41.3 | 20200.0 | 91-MW12 | 9/9 | 2 | 1 |

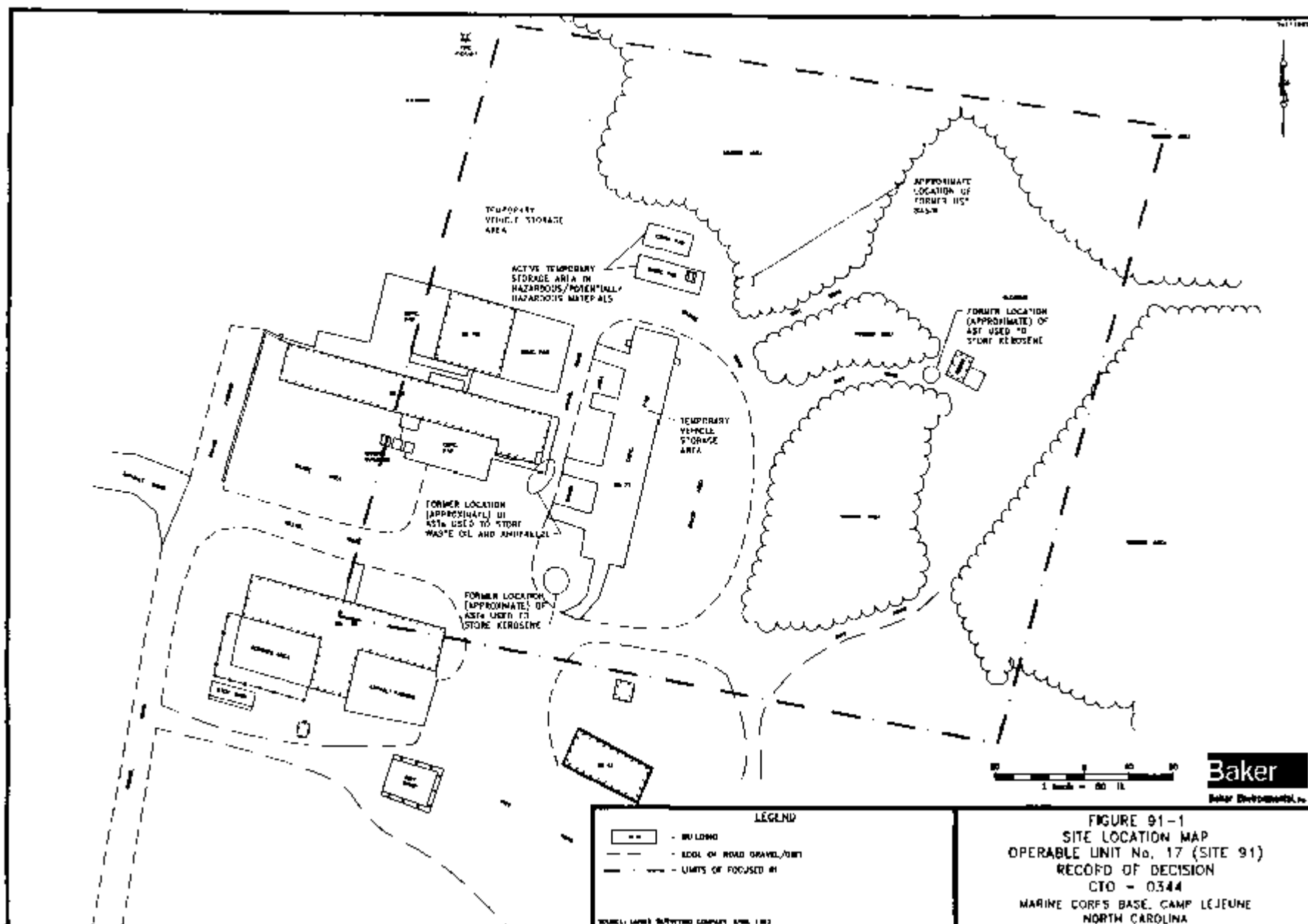
Notes:

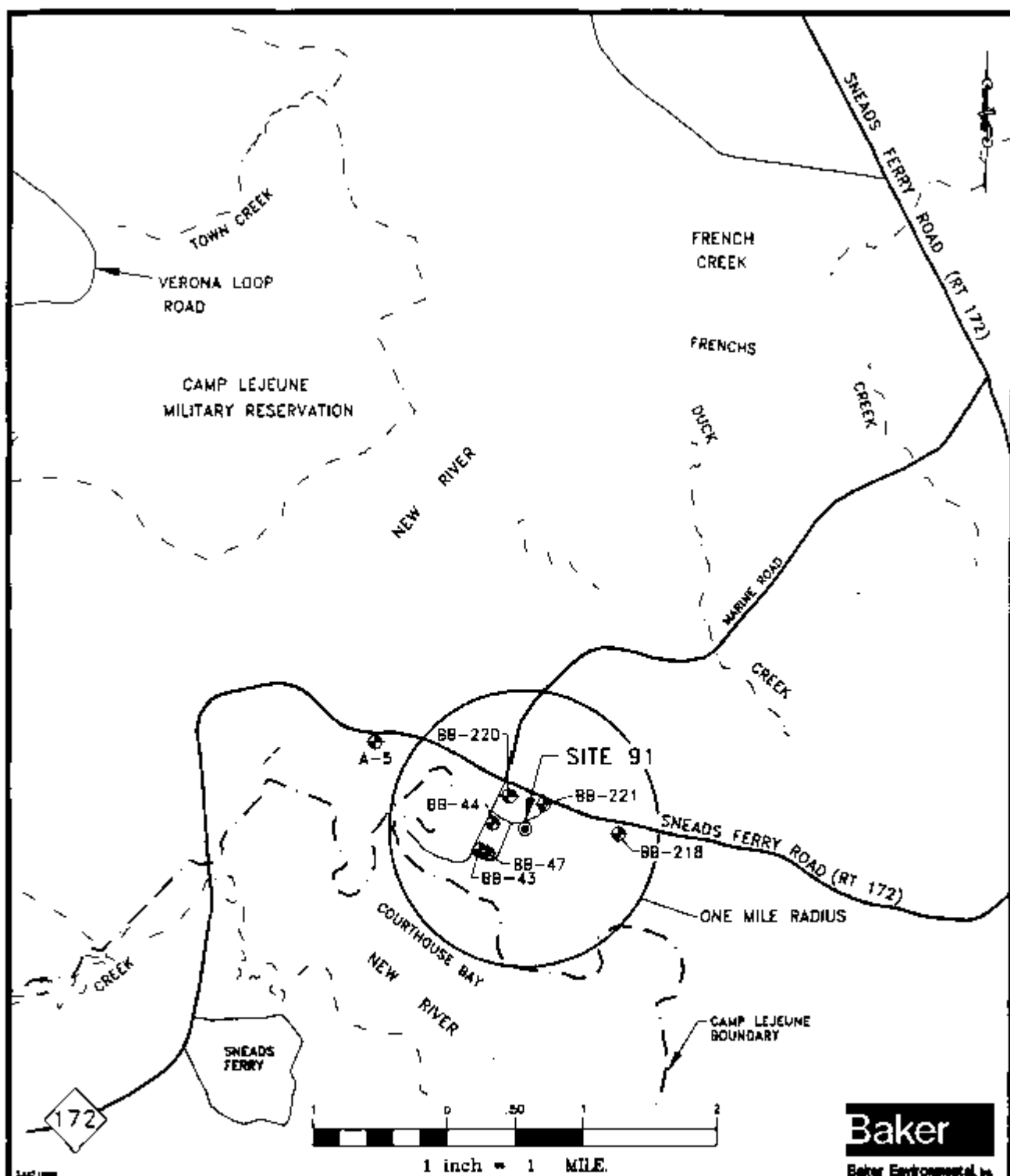
- J = Estimated Value
 B = (Inorganics) The reported value is less than Contract-Required Detection Limits (CRDL), but greater than Instrument Detection Limits (IDLs)
 RBC = USEPA Region III Tapwater Risk -Based Concentration. The RBC value used for non-carcinogenic contaminants used for comparison is the Region III RBC divided by 10. Iron and pyrene were the only non-carcinogenic contaminants detected under the Post -RI Monitoring program.
 NCWQS = North Carolina 2L Water Quality Standards. Values Applicable to Groundwater (North Carolina Administrative Code, Title 15A, Subchapter 21
 NA = Not Applicable
 NE = Not Established



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FIGURES





1440 1000

LEGEND

- - SITE
- ⊕ - ACTIVE SUPPLY WELL
- ⊕ - DEACTIVATED SUPPLY WELL (1991)

SOURCE: GEOPHEX, 1983.

FIGURE 91-3
SUPPLY WELL LOCATION MAP
OPERABLE UNIT No. 17 (SITE 91)
RECORD OF DECISION
CTO - 0344
MARINE CORPS BASE, CAMP LEJEUNE
NORTH CAROLINA

3.0 DECISION SUMMARY - SITE 92

3.1 Site Name, Location and Description

Site 92 is located in the Courthouse Bay Area of MCB, Camp Lejeune and is one of three sites that comprise Operable Unit 17. Sites 90 and 91, discussed previously in this report, are the other two sites included under OU No. 17. The previous investigations at Site 92 focused on a former UST basin where a 1,000-gallon steel USTs, containing gasoline, was previously located. The former UST basin is located at the end of Front Street in confines of the Courthouse Bay Marina. Prior to removal, the tank was located immediately northwest of Building BB-246 (Figure 92-1).

The study area associated with Site 92 is approximately one acre, and is generally located in the vicinity at Building BB-246. During the Focused RI, consideration was given to two buildings and the surrounding areas. The Courthouse Bay Marina is a recreational boating and picnic facility open to all ranks. The facility consists of a boathouse/bait shop (Building BB-246), wooden pier where small private watercraft are docked, recreational boat launch, an AST that contains gasoline for retail sales, metal storage shed, playground and picnic shelters. Building BB-46 (boathouse) no longer exists but has been replaced with a concrete pad. The area around the marina is maintained, has a limited number of trees and is covered with grass. The parking lot adjacent to the Building BB-246 is gravel.

The nearest surface water body is the New River. Courthouse Bay Marina is located on a small peninsula that extends into the New River and forms the southern shoreline of Courthouse Bay. The former UST basin that is located on the north side of Marina facility is located only a few feet from the Courthouse Bay shoreline. The shoreline on the southwest side of the Marina facility is considered to part of the New River.

3.2 Site History and Enforcement Activities

There have been no enforcement activities conducted or are required at this site.

BB-46, which was used as a boat house, has been replaced by Building BB-246. A concrete pad, in the vicinity of where Building BB-46 was located, is now used as a covered picnic area. Northwest of Building BB-46 and north of Building BB-246, one 1,000-gallon steel UST was used to store regular gasoline for retail use. The UST was installed in 1980, deactivated in 1989, and removed in January 1994. A groundwater sample taken during UST closure activities indicated elevated levels of fuel contamination.

Although enforcement activities at Site 92 do not include soil or groundwater remedial actions, various investigations have been conducted. These investigations include the Focused RI, conducted by Baker in August 1997, and a three well site check that was conducted in August 1994 by R. E. Wright Associates, Inc. The results of the site check indicated the presence of chlorinated hydrocarbon groundwater contamination in the vicinity of the former UST basin. Chlorinated hydrocarbons were not associated with materials stored in this UST. As a result, Site 92 was placed in the IRP. The Focused RI was conducted under the IRP. Post-RI monitoring has also been conducted at the site. The following sections summarize the activities and results of these investigations.

At the conclusion of this CERCLA decision, this site will be re-evaluated under the North Carolina UST program due to rule changes in the UST program.

3.3 Highlights of Community Participation

The Final PRAP for OU No. 17 at MCB Camp Lejeune, North Carolina was released to the public on July 11, 2001. This document was made available to the public at the information repositories maintained at the Onslow County Public Library and the MCB Camp Lejeune Library.

A public comment period regarding OU No. 17 was held from July 11, 2001 through August 10, 2001; and a public meeting was held on July 18, 2001. An advertisement for the public meeting was published in the Jacksonville Daily News on July 18, 2001. During this public meeting, representatives from the DoN and the marine Corps discussed the preferred remedial action under consideration. Community concerns were also addressed during the public meeting.

Community comments regarding the preferred remedial action, and the response to the comments received during the noted comment period are included in the Responsiveness Summary section of this ROD.

3.4 Scope and Role of OU No. 17 (Site 92)

No Action is the selected remedial action for OU No. 17, Site 92. The No Action decision is the final recommended action for OU No. 17, Site 92. This decision is based on the findings of the Focused RI field investigation and follow up environmental studies. Justification for this decision is presented within the following sections of this ROD.

3.5 Site Characteristics

3.5.1 Topography and Surface Features

The generally flat topography of MCB, Camp Lejeune is typical of the North Carolina Coastal Plain. Elevations on the base vary from sea level to 72 feet above msl. The elevation of the site is estimated to range from approximately 2 to 10 feet above msl.

The surface of Site 92 is covered with a mix of grasses and trees, asphalt and gravel roads, a boat ramp, a wooden pier, above ground fuel tanks, concrete sidewalks, a playground and various structures. The topographical high point is on the asphalt approach to the boat ramp located on the southeastern boundary of the site and the low point is the shoreline. The natural topography of the site has been modified by man-made features such as concrete and paved areas, concrete culverts and various structures which interfere with the drainage and infiltration of stormwater. Rainwater collected in the culverts and on the concrete and asphalt areas eventually drain into Courthouse Bay and/or the New River. Based on the USGS topographical map for the Camp Lejeune Quadrangle, the flood boundary and floodway map for Onslow County published by the Federal Emergency Management Agency and the site survey conducted as part of the Focused RI, the majority of the site lies within the 100-year floodplain of the New River.

3.5.2 Site Geology

Based on the soil borings that have been advanced at Site 92, the soil conditions are generally uniform throughout the study area. Typically, the shallow soils consist of unconsolidated deposits of sand and silty sand separated by a thick localized clay layer. The elevation of the soil boundary separating the sand and clay is irregular in elevation across the site. These soils represent the Quaternary age "undifferentiated" deposits which overlay the Belgrade and River Bend Formations. Sands are coarse to fine grained and contain varied amounts of silt.

Underlying soils are dense, greenish-gray, fine sand containing varying amounts of silt, clay and shell fragments. This soil unit constitutes the Belgrade Formation typically referred to as the semi-confining unit separating the surficial and Castle Hayne aquifers.

3.5.3 Site Hydrogeology

Only one well (92-TW04) was completed below the clay unit which separates the aquifer and therefore no evaluation of the lower portion of the surficial aquifer can occur. Hydrogeologic characteristics for the shallow aquifer in the vicinity of the site were evaluated by reviewing existing information and installing a network of shallow monitoring wells across the site.

Groundwater was encountered at varying depths during the drilling program. The variation was primarily attributed to topographical changes. In general, the groundwater was encountered between 0.5 and 6.0 feet bgs during field activities.

A single round of groundwater measurements were collected during the field program on April 26, 1997. Groundwater elevations, flow patterns and gradient calculations are illustrated on Figure 92-2. The data indicates that the groundwater at the site is flowing in a pattern similar to the topography with an average gradient of 4.76×10^{-2} ft/ft. The data indicates that the flow is toward the water bodies in the vicinity of the site, as expected. Groundwater in the northern, northeastern and eastern portions of the site appear to be traveling toward Courthouse Bay (located northeast of the site). Groundwater in the northwestern and western portions of the site flow toward the New River (located southwest and west of the site).

3.5.4 Identification of Water Supply Wells

Figure 92-3 identifies the location of the water supply wells within a one-mile radius of Site 92. The locations and descriptions of the five active wells (BB44, BB47, BB218, BB220, and BB221) as the same as those mentioned for Site 90 (Section 1.5.4).

3.5.5 Nature and Extent of Contamination

3.5.5.1 Three Well Site Check

The three well site check included the installation of three shallow monitoring wells (92-MW01, 92-MW02 and 92-MW03) around the former UST basin. The wells were constructed to depths of approximately 13 to 14 feet bgs. Groundwater samples were collected from each well and analyzed for BTEX, VOCs and total lead (Wright, 1993). Soil samples collected from each borehole were analyzed for TPH-gasoline range organics (GRO).

The results from this investigation indicated:

- No detections of TPH-gasoline range organics (GRO) in soil samples.
- No detections of petroleum/fuel related or lead in groundwater samples.
- PCE concentrations in groundwater ranging from 16.0 µg/L to 30.0 µg/L. PCE is not a constituent of gasoline and its source was believed not to be associated with the former UST basin. No free phase product was noted in any of the wells.

3.5.5.2 Focused RI

The field investigation at Site 92 was conducted in April to May 1997 to gather data necessary to determine the horizontal and vertical extent of soil contamination identified in previous investigations, and if groundwater contamination had migrated horizontally and vertically. The field investigation included a soil investigation, a groundwater investigation, a site survey, and IDW management.

Findings of the Focused RI

This section presents the conclusions and recommendations derived from data collected during the Focused RI conducted at Site 92.

Subsurface Soils

- No VOCs were detected in soil samples submitted to the mobile laboratory.
- Acetone was detected in the three confirmatory samples submitted to the fixed-base laboratory. Although the origin of the acetone is uncertain, it is believed these detections are not site-related (as mentioned for Site 90).
- One SVOC, bis(2-ethylhexyl)phthalate, was detected in a confirmatory samples that was submitted to the fixed-base laboratory. These detections are not considered to be site-related.
- A single pesticide (4,4'-DDE) was detected in a confirmatory sample submitted to the fixed-base laboratory. This detection is not considered to be site-related, but associated with previous activity-wide pest control applications.
- A total of 17 metals and three salts were detected in soil samples submitted to the fixed-base laboratory. Sodium exceeded base background concentrations. All other inorganics were comparable with base background concentrations.
- The results of the Focused RI were consistent with the three well site check conducted by R.E. Wright in April, 1994. No fuel-related contaminants were detected in soil samples collected during the Focused RI, or the three well site check.

The results of the sample analysis from the fixed base laboratory appear in Table 92-1.

Groundwater

- Chloroform was detected by the mobile laboratory in groundwater samples collected from two temporary wells. No chloroform was detected in the confirmatory sample that was collected from a permanent well and submitted to the fixed-base laboratory. These detections are not considered to be site-related, but associated with the chlorinated potable water used during field decontamination procedures.
- No organic compounds were detected in the confirmatory sample submitted to the fixed-base laboratory.
- A total of 14 inorganics were detected in the confirmatory sample submitted to the fixed-base laboratory. The concentrations of all detected inorganics are within the range of base background levels. Additionally, concentrations of these compounds did not exceed NCWQS.
- With respect to BTEX, the results of the Focused RI confirmed the results the three well site check conducted by R.E. Wright in April, 1994. No BTEX was detected in groundwater during either investigation.
- With respect to PCE contamination, the Focused RI did not confirm the results of the three well site check. During the three well site check, PCE was detected in all three permanent monitoring wells. No PCE was detected during the Focused RI. Natural attenuation may be potentially responsible for the reduction of this compound.

The results of the sample analysis from the mobile and fixed base laboratories appear in Tables 92-2 and 92-3.

3.6 Summary of Site Risks

A qualitative risk assessment for Site 92 was conducted based on data generated during the sampling and analytical phase of the Focused RI. The risk assessment evaluated the projected impact of COPCs on human health and/or the environment, and employed a similar approach as described for Site 90 (Section 1.6).

3.6.1 Subsurface Soil (COPCs)

Mobile Laboratory

Four subsurface soil samples were analyzed for VOCs only by the mobile laboratory. There were no VOCs detected in the Site 92 subsurface soil samples. Therefore, no VOCs were retained as COPCs for subsurface soil analyzed by the mobile laboratory.

Fixed Base Laboratory

Three subsurface soil samples were analyzed at the fixed base laboratory for VOCs. Acetone was detected at a maximum concentration less than its respective residential soil RBC. However, two detections of acetone were higher than the SSL. Therefore, acetone was retained as a COPC.

Three subsurface soil samples were analyzed for SVOCs. Bis(2-ethylhexyl)phthalate was detected at a concentration less than its residential soil RBC and SSL. Therefore, it was not retained as a COPC.

Three subsurface soil samples were analyzed for pesticides/PCBs. The pesticide 4,4'-DDE was detected in one out of three samples at a concentration less than their respective residential soil RBC and was not retained as a COPC. There were no PCBs detected in the subsurface soil at Site 92 and, therefore, were retained as subsurface soil COPCs.

Three subsurface soil samples were analyzed for inorganics. Aluminum, antimony, barium, beryllium, cadmium, chromium, cobalt, copper, manganese, nickel, selenium, vanadium, and zinc were detected at maximum concentrations less than their respective residential soil RBCs and SSLs. Lead was detected in all samples at a maximum concentration of 4.1 mg/kg, which is less than the USEPA lead action level for soil of 400 mg/kg. Therefore, these metals were not retained as COPCs. Arsenic was detected in one out of three samples at a concentration greater than its residential soil RBC but lower than the SSL. Iron was detected in all samples at a maximum concentration greater than its residential soil RBC and SSL. Therefore, arsenic and iron were retained as subsurface soil COPCs.

3.6.2 Groundwater COPCs

Mobile Laboratory

Seven groundwater samples were analyzed for VOCs, only by the mobile laboratory. Chloroform was detected in two out of seven samples at concentrations exceeding its tap water RBC. Therefore, chloroform retained as a groundwater COPC.

Fixed Base Laboratory

One groundwater sample was analyzed for VOCs by the fixed base laboratory. There were no VOCs detected in the groundwater. Therefore, no VOCs were retained as groundwater COPCs.

One groundwater sample was analyzed for SVOCs. No SVOCs were detected in the groundwater. Therefore, no SVOCs were retained as COPCs.

One groundwater sample was analyzed for pesticides/PCBs. There were no pesticides or PCBs detected in the groundwater samples. Thus, no pesticides or PCBs were retained as groundwater COPCs.

One groundwater sample was analyzed for inorganics. The following inorganics were not retained as COPCs because they were detected at concentrations less than their respective tap water RBCs: barium, cadmium, cobalt, iron, manganese, nickel, and zinc.

3.6.3 Summary of Risk Assessment Results

In summary, chloroform was the only compound retained as a groundwater COPC for Site 92. Acetone, arsenic, and iron were retained as subsurface soil COPCs.

- Acetone was detected in three out of three subsurface soil samples analyzed at the fixed base laboratory at concentrations less than the residential soil RBC. However, two detections were higher than the SSL. This compound is most likely present due to decontamination procedures and is not site-related.
- Arsenic was detected in one out of three subsurface soil samples analyzed by the fixed base laboratory at a concentration that exceeded the residential soil RBC. However, the detected concentration was comparable with the range of base background for arsenic and below the SSL. It is unlikely that the presence of arsenic is site-related.
- Iron was detected in all subsurface soil samples analyzed by the fixed base laboratory with a maximum concentration that exceeded the RBC and SSL but was comparable with the range of base background for iron. It is unlikely that the presence of iron is site-related.
- Chloroform was detected in two out of seven groundwater samples analyzed by the mobile laboratory. All positively detected concentrations of chloroform exceeded the tap water RBC and NCWQS. Chloroform is associated with the chlorination process in the treatment of potable water. It is unlikely that the presence of this compound is site-related.

Acetone, arsenic, and iron were retained as subsurface soil COPCs for Site 92. However, both inorganics were detected at concentrations that were comparable with base background levels. Acetone was most likely present in the soil samples due to decontamination procedures. It is unlikely that the presence of arsenic and iron is site-related.

Chloroform was retained as a groundwater COPC for Site 92. The presence of chloroform is not considered to be site-related.

A summary of COPCs for Site 92 appears in Table 92-4.

3.7 Post-RI Monitoring

In order to verify the presence or absence of constituents that were identified as COPCs during the Focused RI, additional sampling was conducted. The results of the sampling is presented in the following paragraphs.

Several constituents including SVOCS, VOCs, arsenic, iron, and manganese were monitored on a quarterly basis from July 2000 to April 2001 at Site 92. All three existing monitoring wells were samples and the results are presented in detail in the Long-Term Monitoring Report for OU No. 17 and are presented on Table 92-5.

No VOCs or SVOCs were detected in any of the Post-RI Monitoring sampling events. Arsenic was detected in July 2000 in 92-MW02 at a concentration below the Region III Tapwater RBC and NCWQS, and was within the base background concentration range for arsenic. Arsenic was also detected in April 2001, and all detections were below NCWQS and RBC standards. Manganese was detected in all three wells in each quarterly sampling event. Only four detections of manganese exceeded the NCWQS, and two of these exceeded the Region III Tapwater RBC for manganese. These concentrations were within the base background concentration range for manganese in groundwater. Iron was detected in all three wells during each sampling quarter with all detections in 92-MW02 and 92-MW03 exceeding the NCWQS and Region III Tapwater RBC. Three detections of iron in 92-MW01 exceeded NCWQS and one exceeded the RBC.

3.8 Summary of Site Conditions

Three environmental investigations have been conducted at Site 92: the Three Well Site Check, the Focused RI, and Post-RI Monitoring. From these studies, it has been concluded that there are not site-related constituents at Site 92. The constituents that have been detected in the latest Post-RI sampling events are naturally occurring and not site-related.

3.9 Current and Potential Future Site and Resources Uses

Site 92 is currently used for recreational purposes. A boat house, a pier and a covered picnic area are currently at the site. This type of land use at Site 92 is unlikely to change in the immediate future.

As discussed in the previous section, five active groundwater supply wells are located in a one-mile radius. These supply wells will likely remain active in the immediate future.

3.10 Explanation of Significant Changes

The PRAP presents the selected remedy as the preferred alternative for Site 92. No significant changes to the remedy have been made.



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TABLES

TABLE 92-1
SUMMARY OF FOCUSED RI DATA
ORGANICS AND INORGANICS IN SUBSURFACE SOIL
FIXED BASE LABORATORY
OPERABLE UNIT NO.17 (SITE 92)
MCB, CAMP LEJEUNE, NORTH CAROLINA
RECORD OF DECISION
CTO-0344

| Constituent | Range/Frequency | | Comparison to Criteria | | | | | | COPC Selection ⁽²⁾ |
|---|------------------------------|---|---|--|-----------------------|--|-----------------------|------------------------------------|-------------------------------|
| | Range of Positive Detections | No. of Positive Detects/ No. of Samples | Twice the Average Base Specific Background ⁽¹⁾ | No. of Times Exceeded Twice The Average Background Concentration | Residential RBC Value | Positive Detects Above Residential RBC Value | North Carolina SSL | Positive Detects Above NCSSL Value | |
| Volatiles (µg/kg): Acetone | 47 - 8,200 | 3/3 | NA | NA | 780,000 | 0 | 2,810 | 2 | Yes |
| Semivolatiles (µg/kg): Bis(2-ethylhexyl)phthalate | 210J | 1/3 | NA | NA | 46,000 | 0 | 6,670 | 0 | No |
| Pesticides (µg/kg): 4,4'-DDE | 2.7J | 1/3 | NA | NA | 1,900 | 0 | 35,000 ⁽⁴⁾ | 0 | No |
| Inorganics (mg/kg): Aluminum | 836J - 6,000J | 3/3 | 7,375.3 | 0 | 7,800 | 0 | -- | NA | No |
| Antimony | 0.44J | 1/3 | 6.4 | 0 | 3.1 | 0 | 5.42 | 0 | No |
| Arsenic | 5.5 | 1/3 | 1.97 | 1 | 0.43 | 1 | 26.2 | 0 | Yes |
| Barium | 2.8J - 9.9J | 3/3 | 14.2 | 0 | 550 | 0 | 848 | 0 | No |
| Beryllium | 0.03J - 0.13J | 3/3 | 0.19 | 0 | 0.16 | 0 | 3.38 | 0 | No |
| Cadmium | 0.06J | 3/3 | 0.71 | 0 | 3.9 | 0 | 2.72 | 0 | No |
| Calcium | 54.2J- 712J | 3/3 | 391.5 | 1 | NE | NA | -- | NA | No |
| Chromium | 1.4J - 5.2J | 3/3 | 12.6 | 0 | 23 | 0 | 27.2 | 0 | No |
| Cobalt | 0.41J | 1/3 | 1.5 | 0 | 160 | 0 | -- | NA | No |
| Copper | 0.27J-1.1J | 2/3 | 2.4 | 0 | 310 | 0 | 704 | NA | No |
| Iron | 423J- 8,240J | 3/3 | 7,252.1 | 1 | 2,300 | 1 | 151 | NA | Yes |
| Lead | 2.0J- 4.1J | 3/3 | 8.3 | 0 | 400 ⁽³⁾ | 0 | 270 | NA | No |
| Magnesium | 37J - 353J | 3/3 | 260.7 | 1 | NE | NA | -- | NA | No |
| Manganese | 7.2 - 11.3 | 3/3 | 7.9 | 1 | 160 | 0 | 65.2 | NA | No |
| Nickel | 0.71J | 1/3 | 3.7 | 0 | 160 | 0 | 56.4 | 0 | No |
| Potassium | 455J | 1/3 | 347.2 | 1 | NE | NA | -- | NA | No |
| Selenium | 0.48J | 1/3 | 0.8 | 0 | 39 | 0 | 12.2 | 0 | No |

TABLE 92-1 (continued)

**SUMMARY OF FOCUSED RI DATA
ORGANICS AND INORGANICS IN SUBSURFACE SOIL
FIXED BASE LABORATORY
OPERABLE UNIT NO. 17 (SITE 92)
MCB, CAMP LEJEUNE, NORTH CAROLINA
RECORD OF DECISION
CTO-0344**

| Constit uent | Range/Frequency | | Comparison to Criteria | | | | | | COPC Selection ⁽²⁾ |
|--------------|------------------------------|---|---|--|-----------------------|--|--------------------|------------------------------------|-------------------------------|
| | Range of Positive Detections | No. of Positive Detects/ No. of Samples | Twice the Average Base Specific Background ⁽¹⁾ Concentration | No. of Times Exceeded Twice The Average Background Concentration | Residential RBC Value | Positive Detects Above Residential RBC Value | North Carolina SSL | Positive Detects Above NCSSL Value | |
| Sodium | 36.9J - 149J | 3/3 | 52.7 | 1 | NE | NA | -- | NA | No |
| Vanadium | 1.2J - 16.5 | 3/3 | 13.5 | 1 | 55 | 0 | -- | 0 | No |
| Zinc | 0.89J - 3.5J | 3/3 | 6.7 | 0 | 2,300 | 0 | 1,100 | 0 | No |

Notes:

⁽¹⁾ Soil background concentrations are based on reference background soil samples collected from MCB Camp Lejeune investigations.

⁽²⁾ COPC = Chemical of Potential Concern for human health risk assessment (yes/no).

⁽³⁾ Action Level for residential soils (USEPA, 1994).

⁽⁴⁾ Calculated by USEPA Region III

NE = Not established

NA = Not applicable

J = Estimated Value

– = SSL not established.

TABLE 92-2

**SUMMARY OF FOCUSED RI DATA
VOLATILE ORGANICS IN GROUNDWATER
MOBILE LABORATORY
OPERABLE UNIT NO. 17 (SITE 92)
MCB, CAMP LEJEUNE, NORTH CAROLINA
RECORD OF DECISION
CTO-0344**

| Parameter | Groundwater Criteria | | | | | Frequency/Range | | Comparison to Criteria | | | | | |
|------------|--------------------------------|------------------------------|--|---|----------------|---|----------------------------------|---------------------------------------|-------------------------------------|--|---|----------------|----------------------------------|
| | NCWQS ⁽¹⁾ (µg/L) | MCL ⁽²⁾ (µg/L) | Region III Tap Water RBC Value (µg/L) | Federal Health Advisories ⁽³⁾ (µg/L) | | No, of Positive Detects/ No. of Samples | Concentration Range (µg/L) | Positive Detects Above NCWQS | Positive Detects Above MCL | Positiv e Detects Above RBC Value | Positive Detects Above Health Advisories | | COPC Selection ⁽⁴⁾ |
| | | | | 10 kg Child | 70 kg Adult | | | | | | 10 kg Child | 70 kg Adult | |
| Chloroform | 0.19 | 100 | 0.15 | 100 | 400 | 2/7 | 0.2 - 0.3 | 2 | 0 | 2 | 0 | 0 | Yes |

Notes:

- (1) NCWQS = North Carolina Water Quality Standards for Groundwater (October, 2000).
 (2) MCL = Safe Drinking Water Act Maximum Contaminant Level (October, 1996).
 (3) Longer Term Health Advisories for a 10 kg Child and 70 kg Adult.
 (4) COPC = Chemical of potential concern for human health risk assessment (yes/no).

TABLE 92-3
SUMMARY OF FOCUSED RI DATA
ORGANICS AND METALS IN GROUNDWATER
FIXED BASE LABORATORY
OPERABLE UNIT NO. 17 (SITE 92)
MCB, CAMP LEJEUNE, NORTH CAROLINA
RECORD OF DECISION
CTO-0344

| Parameter | Groundwater Criteria | | | Frequency/Range | | Comparison to Criteria | | | COPC Selection ⁽²⁾ |
|-----------|--------------------------------|---------------------------------------|---------------------------------------|--|----------------------------|------------------------------|--|----------------------------------|-------------------------------|
| | NCWQS ⁽¹⁾ (µg/L) | Maximum Base Background Concentration | Region III Tap Water RBC Value (µg/L) | No. of Positive Detects/ No. of Samples | Concentration Range (µg/L) | Positive Detects Above NCWQS | Positive Detects Above Base Background Concentration | Positive Detects Above RBC Value | |
| Barium | 2,000 | 5,410 | 260 | 1/1 | 67.5J | 0 | 0 | 0 | No |
| Cadmium | 5 | 110 | 1.8 | 1/1 | 0.2J | 0 | 0 | 0 | No |
| Calcium | NE | 828,000 | NE | 1/1 | 75,000 | NA | 0 | NA | No |
| Cobalt | NE | NR | 220 | 1/1 | 0.72J | NA | NA | 0 | No |
| Iron | 300 | NR | 1,100 | 1/1 | 247 | 0 | NA | 0 | No |
| Magnesium | NE | NR | NE | 1/1 | 14,700 | NA | NA | NA | No |
| Manganese | 50 | 2,110 | 73 | 1/1 | 27.8 | 0 | 0 | 0 | No |
| Nickel | 100 | 486 | 73 | 1/1 | 0.72J | 0 | 0 | 0 | No |
| Potassium | NE | NR | NE | 1/1 | 2,820J | NA | NA | NA | No |
| Sodium | NE | 156,000 | NE | 1/1 | 100,000 | NA | 0 | NA | No |
| Zinc | 2,100 | 12,100 | 1,100 | 1/1 | 2.2J | 0 | 0 | 0 | No |

Notes:

⁽¹⁾ NCWQS = North Carolina Water Quality Standards for Groundwater (October 2000).

⁽²⁾ COPC = Chemical of potential concern for human health risk assessment (yes/no).

NE - Not Established.

NA - Not Applicable.

NR - Not Recorded in Table 1 of the draft version of the Evaluation of Metals in Groundwater (Baker, 1994).

J - Estimated Value.

TABLE 92-4

**CONTAMINANTS OF POTENTIAL CONCERN
EVALUATED IN THE QUALITATIVE RISK ASSESSMENT
OPERABLE UNIT NO. 17 (SITE 92)
MCB, CAMP LEJEUNE, NORTH CAROLINA
RECORD OF DECISION
CTO-0344**

| Contaminant | Subsurface Soil | Groundwater |
|--|------------------|--------------------------------------|
| Volatiles: Acetone Chloroform | | X ⁽²⁾ X ⁽¹⁾ |
| Inorganics: Arsenic | X ⁽²⁾ | |
| Iron | X ⁽²⁾ | |

Notes:

- (1) Selection as a COPC based on mobile laboratory data.
- (2) Selection as a COPC based on fixed base laboratory data.

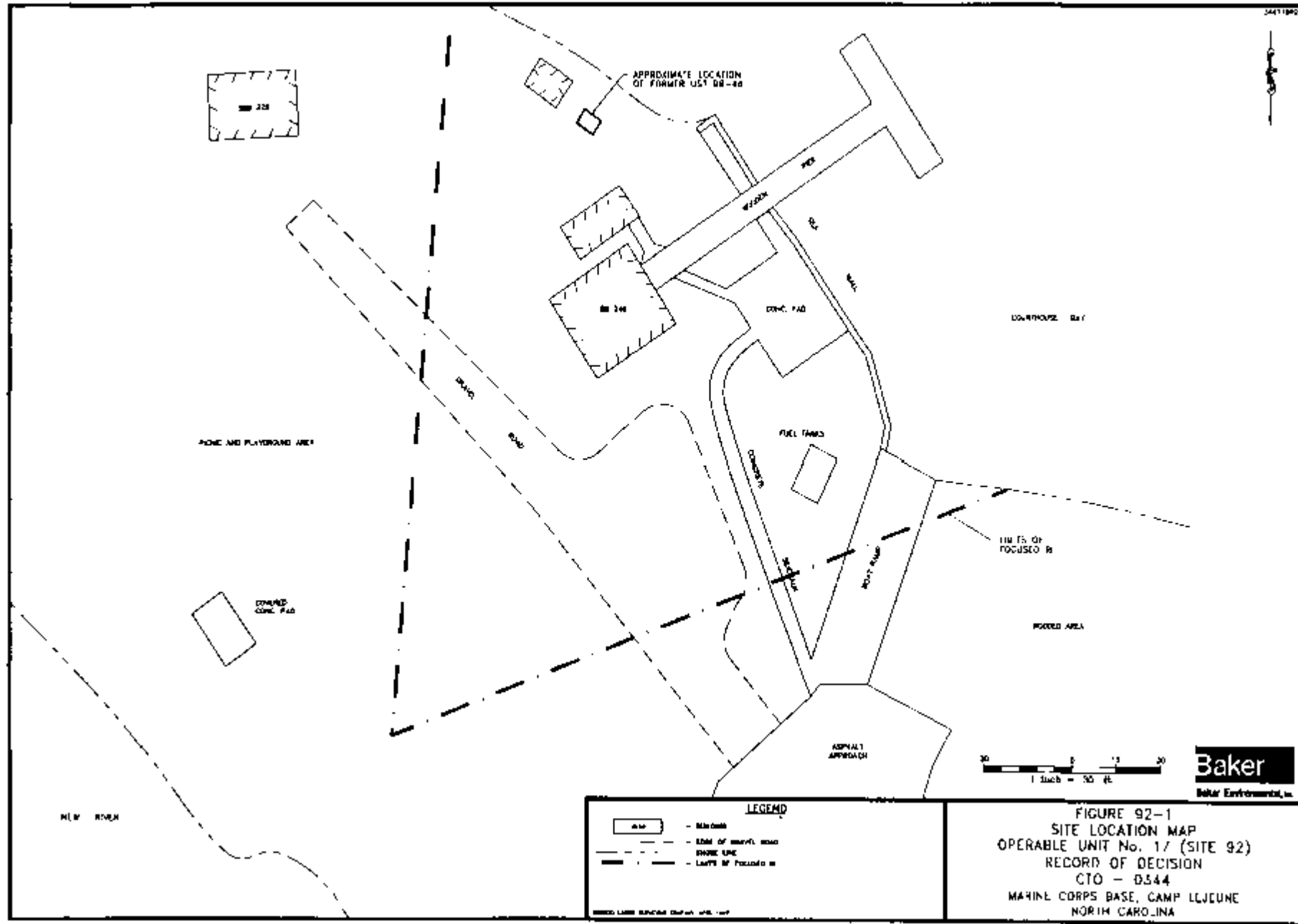
TABLE 92-5

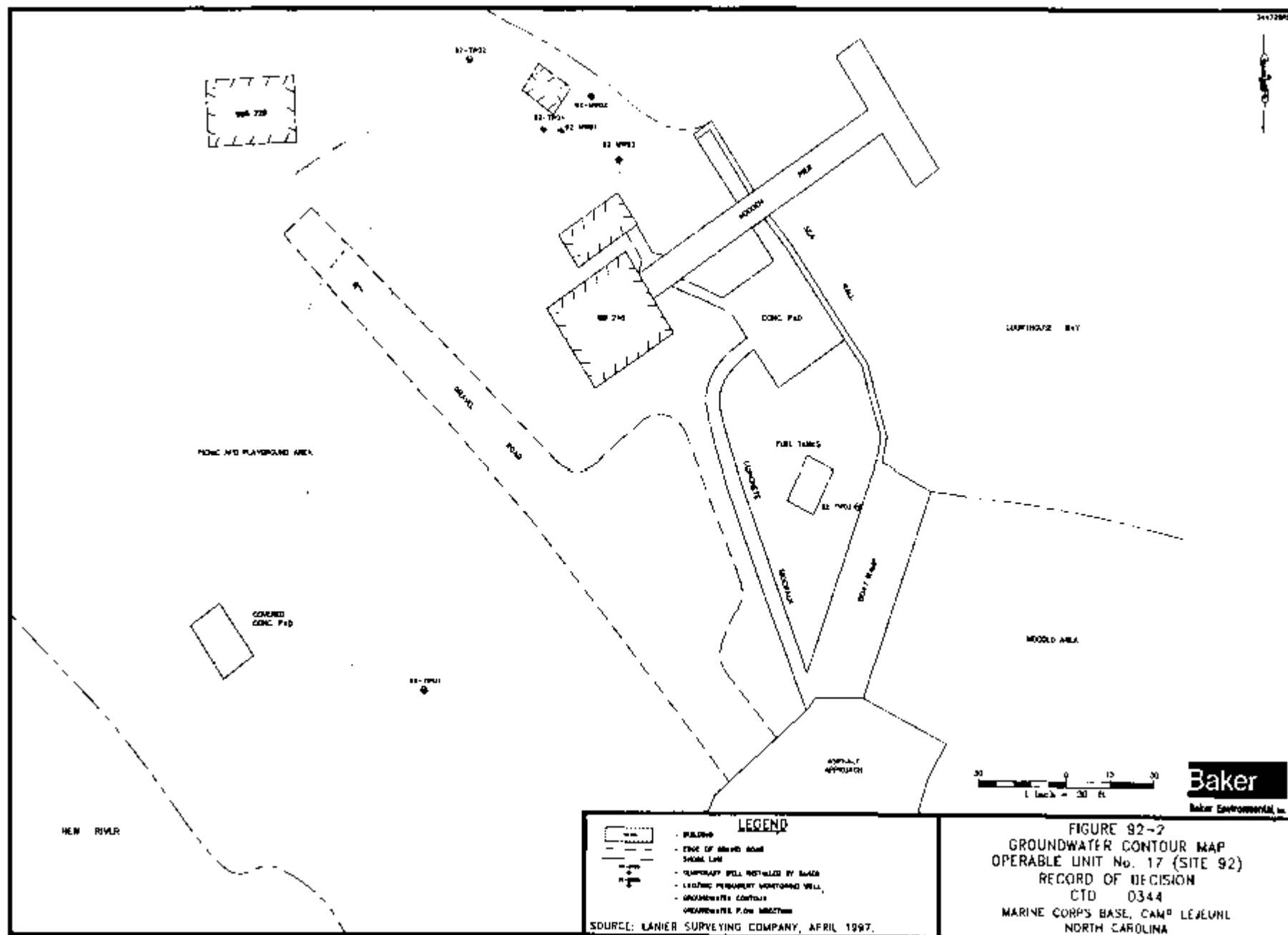
POSITIVE DETECTION SUMMARY OF POST-RI MONITORING DATA
OPERABLE UNIT NO. 17 (SITE 92)
MCB, CAMP LEJEUNE, NORTH CAROLINA
CTO-0344

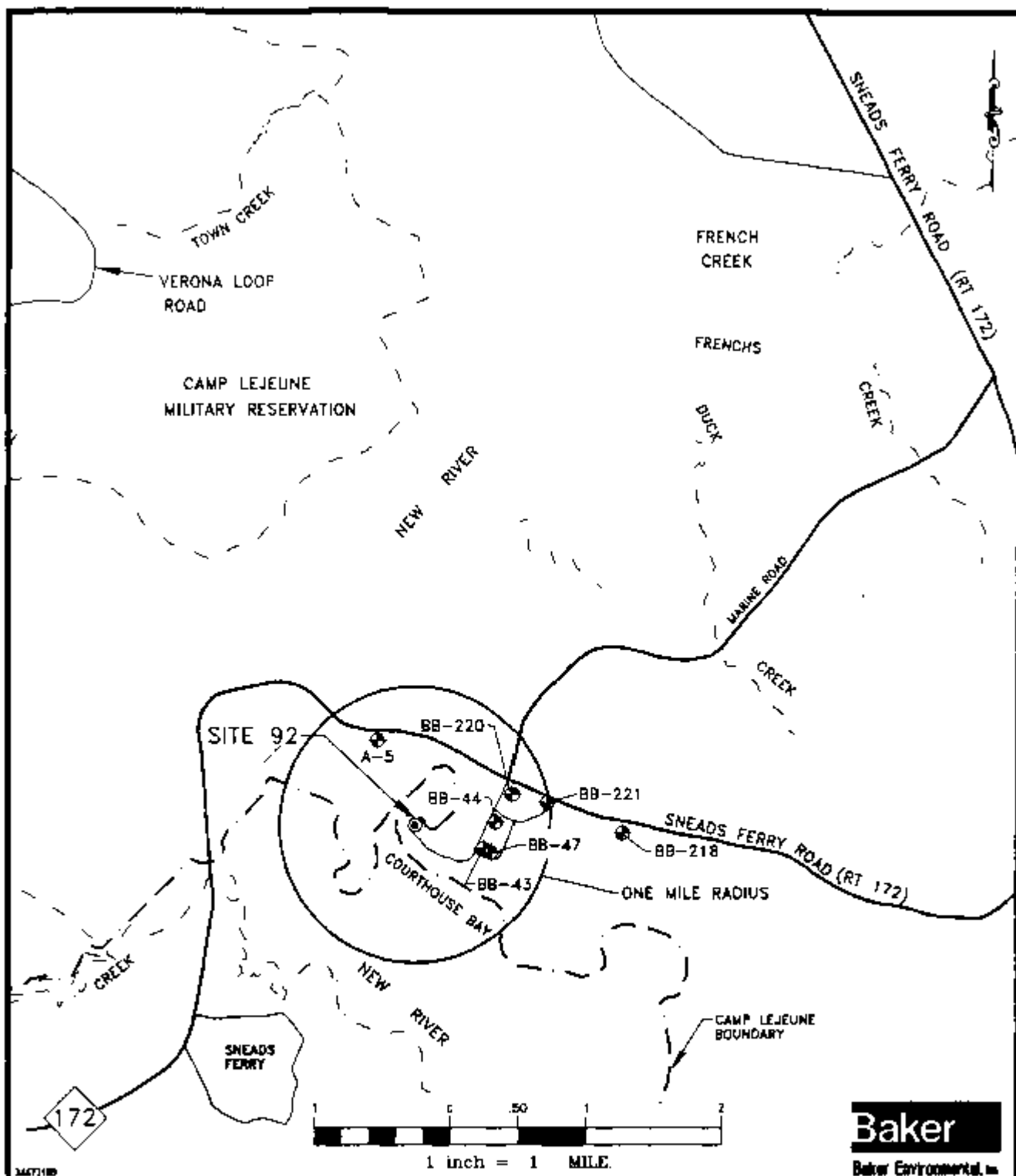
| Detected | Comparison Criteria | | Concentration Range | | Location of | Detection | Detected Above | |
|-----------------------------|---------------------|-------|---------------------|--------|-------------------|-----------|----------------|-----|
| Compounds | NCWQS | RBC | Min. | Max. | Maximum Detection | Frequency | NCWQS | RBC |
| JULY 2000 | | | | | | | | |
| Volatiles (µg/L) | | | | | | | | |
| NONE DETECTED | | | | | | | | |
| Semivolatiles (µg/L) | | | | | | | | |
| NONE DETECTED | | | | | | | | |
| Metals (µg/L) | | | | | | | | |
| Arsenic | 50 | 50 | 3.1B | 31B | 92-MW02 | 1/3 | 0 | 0 |
| Iron | 300 | 1,100 | 238 | 4070 | 92-MW02 | 3/3 | 2 | 2 |
| Manganese | 50 | 73 | 26B | 28 | 92-MW02 | 3/3 | 0 | 0 |
| OCTOBER 2000 | | | | | | | | |
| Volatiles (µg/L) | | | | | | | | |
| NONE DETECTED | | | | | | | | |
| Semivolatiles (µg/L) | | | | | | | | |
| NONE DETECTED | | | | | | | | |
| Metals (µg/L) | | | | | | | | |
| Arsenic | 50 | 50 | ND | ND | NA | 0/3 | 0 | 0 |
| Iron | 300 | 1,100 | 556 | 3200 | 92-MW02 | 3/3 | 3 | 2 |
| Manganese | 50 | 73 | 24.7 | 71.8 | 92-MW03 | 3/3 | 1 | 0 |
| JANUARY 2001 | | | | | | | | |
| Volatiles (µg/L) | | | | | | | | |
| NONE DETECTED | | | | | | | | |
| Semivolatiles (µg/L) | | | | | | | | |
| NONE DETECTED | | | | | | | | |
| Metals (µg/L) | | | | | | | | |
| Arsenic | 50 | 50 | ND | ND | NA | 0/3 | 0 | 0 |
| Iron | 300 | 1,100 | 299 | 2270 | 92-MW02 | 3/3 | 2 | 2 |
| Manganese | 50 | 73 | 5B | 106 | 92-MW02 | 3/3 | 1 | 1 |
| APRIL 2001 | | | | | | | | |
| Volatiles (µg/L) | | | | | | | | |
| NONE DETECTED | | | | | | | | |
| Semivolatiles (µg/L) | | | | | | | | |
| NONE DETECTED | | | | | | | | |
| Metals (µg/L) | | | | | | | | |
| Arsenic | 50 | 50 | 3.9 | 9.9 | 92-MW02 | 3/3 | 0 | 0 |
| Iron | 300 | 1,100 | 1,530 | 24,800 | 92-MW02 | 3/3 | 3 | 3 |
| Manganese | 50 | 73 | 42 | 152 | 92-MW03 | 3/3 | 2 | 1 |

Note:

J = Estimated Value
 B = (Inorganics) The reported value is less than Contract-Required Detection Limits (CRDL), but greater than Instrument Detection Limits (IDL).
 D = Compound identified in an analysis at a secondary dilution factor
 RBC = USEPA Region III Tapwater Risk-Based Concentration. The RBC value used for non-carcinogenic contaminants used for comparison is the Region III RBC divided by 10. Iron and manganese are the only non-carcinogenic contaminants detected under the Post-RI Monitoring program.
 NCWQS = North Carolina 2L Water Quality Standards. Values Applicable to Groundwater (North Carolina Administrative Code, Title 15A, Subchapter 2L).
 NA = Not Applicable
 NE = Not Established
 ND = Not Detected







3467189

LEGEND

- - SITE
- - ACTIVE SUPPLY WELL
- - DEACTIVATED SUPPLY WELL (1991)

SOURCE: GEOPHEX, 1983.

FIGURE 92-3
SUPPLY WELL LOCATION MAP
OPERABLE UNIT No. 17 (SITE 92)
RECORD OF DECISION
CTO - 0344
MARINE CORPS BASE, CAMP LEJEUNE
NORTH CAROLINA

RESPONSIVENESS SUMMARY

The selected remedy for Sites 90, 91, and 92, OU No. 17, is No Action.

The USEPA Region IV and NC DENR are in support of the selected remedy outlined herein for OU No. 17. A concurrence letter from the NC DENR is included in Appendix A.

Based on comments received from the audience at the July 18, 2001 public meeting, the public supports the selected remedy for OU No. 17. No additional comments were made during the public comment period which ended on August 10, 2001. The public meeting consisted of a presentation of OU Nos. 9 and 17, and question and answers. OU No. 17 was presented during the second half of the meeting. The transcript from the public meeting is included in Appendix B. The entire transcript for both OUs has been reproduced in this ROD because both presentations were included in the same legally sealed and certified report document.

The attendees of the public meeting included representatives from Naval Facilities Engineering Command, Atlantic Division (LANTDIV); MCB Camp Lejeune Environmental Management Division (EMD); NC DENR Superfund Section; USEPA Region IV; Restoration Advisory Board (RAB) Community Members; and Baker. In attendance were:

| | |
|----------------------|----------------------------|
| Laura Baker | RAB Community Member |
| Ellen Bjerklie Hanna | Baker |
| Rich Bonelli | Baker |
| Thomas Burton | MCB Camp Lejeune EMD |
| Heather Govenor | Baker |
| Carrie Anne Hayward | RAB Community Member |
| Bart Herpel | Community Member |
| Ray Humphries | RAB Community Member |
| David Lown | NC DENR, Superfund Section |
| Steve Martin | LANTDIV |
| Rick Raines | MCB Camp Lejeune EMD |
| Kirk Stevens | LANTDIV |
| Jim Swartenberg | RAB Community Chairperson |
| Gena Townsend | USEPA Region IV |
| Karren Wood | Baker |

In general, the meeting attendees asked for clarification of terms, methodologies of sampling procedures, screening and interpretation of analytical results, and whether or not drinking water has been impacted.

One question that was not resolved at the time of the meeting was in regards to methyl tertiary butyl ether (MTBE) in groundwater. The attendee asked if MTBE was detected at Site 92 where the UST contained gasoline. MTBE has been used as a gasoline additive as a lead replacement or as a fuel oxygenate as part of the Wintertime Oxyfuel and Federal Reformulated Gasoline (RFG) programs initiated in 1992 and 1995, respectively. No gasoline was stored at Sites 90 and 91 so it was not tested for at these sites. At Site 92, gasoline was stored in the UST. No gasoline related compounds were found in the soil or groundwater. Accordingly, since there was no evidence of gasoline related compounds in the soil or groundwater, MTBE should not be present.

REFERENCES

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- Baker Environmental, Inc. 1996. Draft Remedial Investigation/Feasibility Study Project Plans, Operable Unit No. 17 (Sites 90, 91 and 92), Marine Corps Base Camp Lejeune, North Carolina. December 1996. (pending comments).
- Baker Environmental, Inc. 1994. Draft Evaluation of Metals in Groundwater, Marine Corps Base Camp Lejeune, North Carolina. June 1994.
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- North Carolina Department of Environment, Health and Natural Resources (NC DEHNR) Division of Environmental Management, Classifications and Water Quality Standards Applicable to the Groundwaters of North Carolina. North Carolina Administrative Code, Title 15A, Subchapter 2L, Sections .0100, .0200 and .0300.
- North Carolina Department of Environment, Health and Natural Resources (NC DEHNR) Division of Environmental Management, North Carolina Criteria and Standards Applicable to USTs, North Carolina Administrative Code, Title 15A, Chapter 2, Subchapter 2N, Section .0706.
- R.E. Wright Associates, Inc. 1994. Three Well Site Check. UST BB-46, Marine Corps Base Camp Lejeune, North Carolina. November 1994.
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Baker Environmental, Inc.

APPENDIX A

State of North Carolina Concurrence Letter

**NORTH CAROLINA
DEPARTMENT OF ENVIRONMENT AND NATURAL RESOURCES
DIVISION OF WASTE MANAGEMENT**



MICHAEL F. EASLEY, GOVERNOR
WILLIAM G. ROSS, JR., SECRETARY
DEXTER R. MATTHEWS, INTERIM DIRECTOR

September 4, 2001

Commander, Atlantic Division
Naval Facilities Engineering Command
1510 Gilbert Street (Building N-26)
Norfolk, Virginia 23511-2699

Attention: Mr. Kirk Stevens
Navy Technical Representative

Commanding General
Marine Corps Base
PSC Box 20004
Camp Lejeune, NC 28542-0004

Attention: AC/S, EMD/1RD


RE: State Conditional Concurrence on the
Record of Decision (ROD)
Operable Unit No. 17 (OU17), Sites 90, 91, and 92
MCB Camp Lejeune, North Carolina

Dear Mr. Stevens:

The North Carolina Superfund Section has reviewed the Final ROD for OU 17, Sites 90, 91, and 92 and concurs with the no action remedy subject to the following conditions:

1. Our concurrence on the ROD and of the selected remedy for the site is based solely on the information contained in the ROD. Should we receive additional information that significantly affects the conclusions or remedies contained in the ROD, we may modify or withdraw this concurrence with written notice to the Navy and MCB Camp Lejeune.
2. Our concurrence on the Interim ROD in no way binds the State to concur in future decisions nor commits the State to participate, financially or otherwise, in the cleanup of the Site. The State reserves the right to review, comment, and make independent assessments of all future work relating to this Site.

We appreciate the opportunity to review this ROD and look forward to continuing to work with MCB Camp Lejeune, the Navy, and EPA at Camp Lejeune.

Sincerely,

Grover Nicholson, Head
Federal Facilities Branch
Superfund Section

cc: Gena Townsend, US EPA Region IV
Neal Paul, MCB Camp Lejeune

1646 MAIL SERVICE CENTER, RALEIGH, NORTH CAROLINA 27699-1646
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APPENDIX B

Public Meeting Transcript

MARINE CORPS BASE (MCB)
CAMP LEJEUNE, NORTH CAROLINA

PUBLIC MEETING REGARDING

THE

PROPOSED REMEDIAL ACTION PLAN (PRAP)

FOR OPERABLE UNITS (OUs) NO. 9 (SITE 65)
AND NO. 17 (SITES 90, 91 AND 92)

July 18, 2001
Coastal Carolina Community College
Jacksonville, North Carolina

Reported by:

Kathryn F. Kilpatrick
Carolina Court Reporters, Inc.
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Greenville, North Carolina 27858
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| PRESENTATION ON OU 17, SITES 90, 91, AND 92 BY MS. ELLEN BJERKLIE HANNA INCLUDING QUESTIONS BY ATTENDEES..... | 14 |
| Adjournment of Meeting..... | 29 |

MR. RAINES: I want to thank you all for coming out. Once again, we don't get a whole lot of public participation; kind of, either the public doesn't have a good deal of trust in the work we're doing on base or they're just not interested, but I want to welcome you here tonight. We're here to talk about the proposed remedial action plan for four sites. These four sites are grouped under two different Operable Units. One Operable Unit is OU 9, Site 65. It is an old five-acre dump. It is physically located out at Courthouse Bay back in the woods. This dump was used mainly for construction debris, but it also had some liquids disposed there and some batteries and things like that. The other Operable Unit is 17, and it includes Sites 90, 91, and 92. These three sites were old underground storage tanks that, upon removal, it was discovered that there was some solvent ground water contamination. We spent a couple of years investigating these sites and, as part of the CERCLA process, once we have completed our investigation, we are required to present our findings and our proposed plan to the public for their comments. We are proposing a no-further-action record of decision for these sites, based on the fact that there is very little contamination associated with these sites, and the fact that there is no human health or environmental risk associated with these sites. Tonight, we have with us representatives of the EPA, the State Department of Environment and Natural Resources, and Baker Environmental, our engineering consultant, on-base contractor. They will be giving a presentation tonight, explaining what we have done, what we have found, what we are proposing.

If

you have any questions, go ahead and just stop them. If you would, state your name for the court reporter, and then at the end we will go ahead and have a question-and-answer session so that we can make sure that we address all your questions. Rich Bonelli is with Baker, and he will start this off.

MR. BONELLI: Before I begin, I want to introduce some of the Baker team who came down with me this evening. With me is Ellen Bjerklie Hanna, who will be presenting on OU 17; Karen Wood, who is our lead human health risk assessment specialist; and Heather Governor, who is our lead ecological risk assessor. Please feel free to ask questions, and I will be speaking this evening on OU 9. The purpose and objective of our meeting this evening is to provide the community with the overall understanding of the investigation, findings and results, to inform the community of the process used for the selected remedy, and lastly we want to make sure that the concerns of the community are met in terms of addressing the selective remedies we will be speaking to tonight. As far as the topics that I want to cover, I'll be talking a little bit about the site description and history. I'll then get into an overview of the investigations and their findings and a summary of the site risks. I'll then move into the scope and role of the proposed response actions. Lastly, again, questions and answers. But feel free to ask questions as I'm going along.

Site 65, OU 9, is located in the southern part of Camp Lejeune, near Courthouse Bay. Originally, Site 73 was also included within OU 9 but was removed because of additional studies

that will be going on there, so right now, Site OU9 only includes Site 65.

Site description: As Rick said, the site is very heavily wooded. Really, the only open space is located just east of the site where the Engineering School resides. There are two small ponds located just east of Site 65 we also looked at during our investigation.

Site History: This site operated -- operations occurred there from 1952 to 1972, of which, reportedly, there were two separate disposal areas, one related to battery acids, the second one related to POL wastes (or petroleum, oil and lubricants). In addition to those areas, through investigations of aerial photography, we also noted a burn area on the site as well as these large debris mounds, or piles, which were predominantly there from the operations of the school. They do a lot of training with bulldozers. As I show you some of the pictures, you'll see some of these mounded areas. Here's a site plan of the area. The investigation boundary, study area, was up in this area here. You'll notice the debris piles here, the burn area, which we discovered through review of the aerial photography. To the east, the heavy equipment training area, and further east we have the two ponds which I spoke of earlier. This is a panoramic shot we took during the RI. Again, it's a very heavily wooded site. You'll notice in the background these mounded areas, again created from the bulldozing operations from the school. This picture identifies

some of the pails, corroded cans, we found as part of the debris. None of the cans that we found, none of the discarded debris contained any waste or liquids in them. They're very old and corroded. This is a shot of Courthouse Bay Pond. Again, notice the very heavily wooded area. The color of the pond water is very turbid, and that was created from water in the runoff. There is a lot of runoff through soils that ended up in the pond here.

Overview of the Investigation and the Findings: For the most part, there have been three studies conducted at the site, the first one being the Site Inspection by Baker back in 1991, the Remedial Investigation conducted by Baker in 1995, report coming out in 1997, and post-RI sampling, which was conducted just recently, April of this year. The Site Inspection study (the SI) -- and SI is one of the very early studies done in the CERCLA process. Predominantly, the SI is done to give us some initial understanding of the volume of waste that may be there, estimated areas of contamination, and things like that. It was a very small-scaled operation we were studying, but we looked at some of the focused areas. The investigation itself -- we looked at soil, we looked at ground water, installing some shallow ground water monitoring wells, and we collected surface water and sediment samples from the two ponds that I spoke of earlier.

The Results of the SI and the Recommendations: In the soil and ground water, surface water and sediment, we did find some low

levels of organic compounds, as well as some inorganics, being metals. Probably the most important, I guess, detection, if you will, from the study are some of the compounds we found in the soil. The recommendation of the SI recommended the site then move into what's called the RI process (or Remedial Investigation), which is the next step in the CERCLA process. The RI, again, was conducted back in 1995. The Remedial Investigation was a continuation of the SI, and was expanded to include not just the immediate area Site 65. We also included some areas to the east in the Engineering School area. Again, we also looked at the ponds. The purpose of the RI was to better define the levels of compounds that we detected, but also to perform a human health and ecological risk assessment based on the data. The field program itself -- again, we looked at a number of different media from the soil and the ground water. We installed some additional monitoring wells. We sampled the surface water and sediment from the ponds. We also did some exploratory test pits, in which we had a backhoe on site, and we did some digging around to see if we could find any buried materials or wastes. And lastly, biological sampling of the ponds, which included both the fish and benthic organisms. Here is a site map showing the locations during the Remedial Investigation. Again, most of our sampling activities were focused in this area here in the debris piles, in the burn areas, and we expanded the investigation to also look at some areas to the east. And lastly, again, we took some samples from the two ponds.

RI Results: I'm not going to go through each and every one of these in great detail. In general, we did find organic compounds and inorganics in all the various media. Predominantly, a lot of the organic compounds -- and when I say organic compounds, I'm referring to the volatiles and semivolatiles, PCBs and pesticides. There were a number of these compounds that were either laboratory contaminants or associated with plasticizers which show up in some of the sampling equipment. Some of the PAHs, which are a subset of the semivolatiles, did show up in the area of the burn operation, which we expect. Anytime you burn materials, you have a residue that is left behind. You're going to find some PAHs. In terms of the fish data, as you see here, we did find some both organic and inorganic compounds and metals. As far as the first number you see that is kind of large, the problem was a compound called acetone, which is associated with a laboratory contaminant. By and large, the inorganics that we found to be in the metals were probably ubiquitous or naturally occurring in the environment if you find a lot of metals, such as iron and manganese that are very common, both in the ground water as well as the soil. Lastly, in April of this year, we conducted some post-RI sampling. Early -- I believe it was January of this year -- near Site 65, they found some containers not -- you'll see the map next -- not necessarily at Site 65 but in the general area. It was felt at that time that sampling needed to be conducted just to confirm or deny whether the contaminants or anything had leaked from these containers. As far as where that area was, again, here is the main Site 65 area we

looked at during the RI. The area where we found the containers is down in this area here. It is some distance away from the investigative area.

Post-RI Investigation: We looked at the soil, ground water, surface water, and sediment in the immediate area of those containers. We took some soils. Ground water was collected from some hydropunches to get an idea of the ground water. And there was a creek that ran very close to the containers themselves, and we sampled surface water and sediment as well. The results showed that the area around those areas was not impacted from a leak or disposal of those containers, which was good. So we didn't really identify anything that could have come from those containers.

Summary of the Risks: I may have mentioned earlier about the Remedial Investigation. As part of that process, we will conduct a human health risk assessment and ecological risk assessment. The human health risk assessment will look at current situations as well as future situations for the contaminants of potential concern. We also look at a number of potential receptors nearby, and those receptors could be military personnel, children, construction workers. The information from the sampling data itself, we take that information, combine it with the different scenarios, and we try to come up with a risk, or develop a risk assessment number through various calculations. I followed the EPA guidelines. Our risk assessment showed that the site was found to

be within the acceptable range of the USEPA guidelines. I mentioned earlier about some of the inorganics found in the fish. We did find a slight exceedance from the mercury for young children through the consumption of fish. It is interesting to note that the other media on the site -- we looked at the ground water, surface water, and so forth -- did not have mercury. So, we concluded that the fish were brought in from somewhere else and basically put in the pond as part of a stocking, I guess, if you will, of the ponds. So, we believe that the fish themselves did not come from the site. Thus, we would make the conclusion that the inorganics found in the fish did not come from activities at the site. Ecologically, we also conducted a risk assessment there to look at the endpoints for both aquatic organisms living in the pond as well as terrestrial organisms -- rabbits, things like that, that may live in the area. The only thing we found there was a potential risk -- ecological from the pond itself, predominantly from the suspended material we noted in the surface water. If you think of the picture I showed you earlier, it was very turbid. In the area at the site at the pond, you've seen a lot of runoff from the area; it was very turbid. So, we believe that the ecological risk there was created from the suspended material in the water itself. The conclusions that we reached from the risk assessments were that there were no releases of the substances on the site that generated an unacceptable risk both to human health and the environment; again, a very sophisticated process of going through a lot of numbers and a lot of calculations to reach those

conclusions. The proposed action at the site is no action at all, which means that the site will be left as is, current conditions. Again, this recommendation, these conclusions were reached through a number of sampling rounds we conducted in the SI, in the RI, and the post-RI, and through our evaluation of site risks. This will be concluded through a no-action ROD, which will be coming out sometime in September, but that's going to be our proposed remedy for this site. That concludes my presentation. If there are any questions that I can answer or our Baker team here.

MR. SWARTZENBERG: I want to ask you about the fish. You said there was a slight risk for children if they ate the fish?

MR. BONELLI: Yes. That's based on a -- Heather, you could probably speak to this better than I can, or Karen, can you maybe address that? That is Karen Wood from Baker.

MS. WOOD: Can you state your question again?

MR. SWARTZENBERG: I was concerned about the fish. First of all, how can you be so certain that it came with the fish you say were stocked there? Did anybody check with fish wildlife to see if there were any stocking programs there?

MS. WOOD: I believe at the time we did, and then this data was also reviewed by a toxicologist from the State of North Carolina, so there were some indepth further studies that addressed that issue at the time. And it was concluded that the fish were stocked, and the toxicologist felt those concentrations really would not pose a human health risk. The equations we use to calculate risk to humans in that particular scenario are very

conservative. That's assuming a child would eat a meal of something -- I don't remember the exact numbers -- but it's several grams of fish tissue on a daily basis. We try to look at the most conservative exposure assumptions.

MR. RAINES: Even fish from that pond?

MS. WOOD: Yes.

MS. TOWNSEND: I would like to add -- I'm Gena Townsend with EPA. When we saw that data in '97, before we even conducted the risk assessment, we were a little concerned ourselves. We sent that data to the state toxicologist in the Department of Public Health division, and -- I'm not sure what division -- and let them look at the data. We also did, I guess, a little more detail in the different type of fish, and the tissue samples were versus a whole fish, versus the edible part of the fish. And the recommendation from the State was that it's okay. So, we did have that concern before we even completed our investigations. And that all was addressed back in '97 and '98, so we're pretty confident that we're pretty clear on that.

MR. SWARTZENBERG: So, there is no mercury in the water, is that what you're saying?

MS. TOWNSEND : Right.

MR. SWARTZENBERG: It's just in the fish.

MS. TOWNSEND: Right. The mercury that we detected we only detected it in the fish. We did not detect it at the site in the soils or the water at all.

MR. SWARTZENBERG: Okay. So if I wanted to go fishing

there, I could go fishing there tomorrow, right? It's not off limits or anything.

MR. RAINES: You'd just have to check with the game warden on base, but I would imagine you probably could.

MR. SWARTZENBERG: Okay.

MR. HUMPHRIES: How do you determine where to get your core or your soil and water samples? Let me paint you a scenario. That's a training area also, which means that over the years, engineers, contractors, they've used it for training and what-have you. Anytime you're out in the field, four or five, sometimes a couple of weeks, the drivers and operators of these various pieces of equipment, they do first- and, sometimes, second-eschelon maintenance. From '52 to '72, they had no rules. You dumped oil right where it fell. You could top off with a tank or something, you'd have spillage, it goes right into the soil then. That's all over the place. My question is how do you determine where you get your soil samples?

MR. BONELLI: One thing we did, Mr. Humphries, was to go back and look through historical aerial photographs, dating back to all those years. One of the issues, obviously, is when we get out there it is so heavily wooded, where do you go? We were able to find historical photographs that showed us areas that were cleared, like the burn area that I spoke of earlier. So, we tried to use aerial photography to position our samples. Obviously, going to the outside, we sampled an area where we thought that could be impacted. So that sampling event, we kind of expanded outward

using, again, historical photographs. There may have been some interviews conducted with some people to find out operations, but they weren't just put on a map. There was some thought process behind them as far as where to go.

MR. HUMPHRIES: It's a lot of guesswork though.

MR. BONELLI: Well, it's a very large area, and the aerial photographs were extremely helpful because they did show, again, some areas that were cleared that looked like they could have been potential disposal operations, and so that was sort of the basis of where we sampled.

MR. HUMPHRIES: How big is the area, do you know? How many acres?

MR. BONELLI: I think the dump area itself that I showed you is five acres in size. And, obviously, that's just the dump area. We investigated a lot larger area than that. When it goes out to the Engineering School area and the pond, that's well above and beyond the five acres. Anybody else that has some questions? Thank you very much. I just need a minute to change the slides over. Ellen will be speaking about OU 17.

MS. HANNA: As Rich said, my name is Ellen Bjerklie Hanna with Baker, and I'm presenting today on Operable Unit No. 17, which includes three sites, Sites 90, 91 and 92. It's the same format as Rich went over. We need to present this information to the public so that we can get feedback from you on what our recommended response is. I'll be giving you a brief history, talking about the studies that were done and a summary of the site risks. You can

feel free to ask questions as I'm going along, but also at the end. This is Operable Unit 17 here. It's close to where OU 9 was that Rich spoke about. These three sites are right off of Courthouse Bay, and they were grouped together because all three of them were former UST sites (underground storage tanks). There were several programs done at these sites. As I said, they were underground storage tank sites. There were three well site checks done at each of these sites, and this is in the UST program. They installed three monitoring wells and took samples of soil and ground water, and based on the results of that, they may or may not have gone on to what's called the Leaking Underground Storage Comprehensive Site Assessment. Then, depending on the results of that, you will see later, they ended up in the Installation Restoration Program, where we did a Remedial Investigation and then followed up with Post-RI Investigations. Site 90, the first site, had three 1,000 gallon tanks. There also happened to be at this site an above-ground storage tank (AST), and it's basically used for industrial/commercial land use. There was a dry cleaning facility at this site. And here are some photographs. This is after the tank removal. Here's one of our monitoring wells that was installed during the three well site check. That's looking at the site from a different angle. As you can see, it's open, grassy areas among some buildings. And here is a drawing of the site. The tank was located approximately between these two buildings. During the three well site check, which was conducted in 1993, as I said, three monitoring wells were installed. They sampled

subsurface soil and found several contaminants associated with underground storage tanks, and BTEX, which is benzene, toluene, ethylbenzene, and xylene in the ground water. Based on that, because they found those contaminants in the subsurface soil and ground water, they put that site into -- they did a study called the Leaking Underground Storage Tank Site Assessment, and they found two areas of ground water contamination, the northern area and the southern area, which -- the northern area was around up here. There was a small plume down here. And we found several contaminants in the ground water, relatively low levels. In the subsurface soil, we also found BTEX petroleum which you might find this at an underground storage tank site. They also found total chlorinated hydrocarbons and, because of those chlorinated contaminants, it was put into the Installation Restoration Program, and we did a Focused Remedial Investigation. They sampled for subsurface soil and ground water, and we took several samples. We detected these contaminants in the subsurface soil and several contaminants in the ground water, including PCE. These are the sampling locations for the RI. We installed more wells, in addition to the wells that were already there from that underground storage tank study. Those were subsurface soils and the samples and locations, and these were the ground water sample locations. They were basically the same locations, because as they installed the monitoring levels, they also took soil samples. Based on the analytical results that came back during the post-RI, we did a qualitative risk assessment, and for the qualitative risk

assessment, we took those results and screened them against various levels that were established by the EPA and North Carolina -- for both the soils and the groundwater, including these listed here. Risk Based Concentrations and the North Carolina Soil Screening Levels, we also looked -- compared the concentrations against QA/AC blanks and naturally occurring levels. At Site 90, no COPCs were identified in the subsurface soil. A COPC is a contaminant of potential concern. If one of the concentrations exceeded any of these screening levels, it was listed as a contaminant of potential concern. Nothing was identified from the subsurface soil. However, in the ground water there were a few identified -- some inorganics and PCE and chloroform. The inorganics were at levels that were considered naturally occurring. Inorganics occur in the site -- they are in the earth's crust everywhere, and they were within these levels of what we consider common around the Camp Lejeune area. So, there was nothing out of the ordinary, and there was no reason to suspect why there would be any kind of metals contamination at this site. Chloroform, we believe, was related to laboratory contamination or our decontamination procedures. It's a common contaminant that comes up. Therefore, only the PCE, which is tetrachloroethene, was considered to be site related. Because of the PCE detection, which was in one monitoring well at the site, we decided to do a supplemental ground water investigation, which was conducted in 1999 just to confirm the PCE concentration and, also, to make sure that those contaminants we believed were laboratory or decontamination related were such. Several

contaminants were found. Most of them, actually all of them, were believed to be not site related because we confirmed that they were laboratory or decontamination procedures. We did not detect tetrachloroethene, but we detected TCE (trichloroethene), and it did exceed the risk based concentration. That was out of the same well that PCE was detected in before, and that was the only well that it was detected in.

MR. SWARTZENBERG: Was that the well that was the closest to the above-ground storage tank?

MS. HANNA: It was near a concrete pad, actually, which was closer to the AST location. The AST contained, at one point, dry cleaning fluids, and that had been discontinued. Rich, do you know what year maybe that was discontinued?

MR. BONELLI: It's been a while.

MS. HANNA: Yeah, it was a long time ago. It used to be a dry cleaning operation, but was stopped, and then it became only a distribution center. Because of that, we did a Temporary Well Delineation Study -- because of the TCE. There were no wells immediately near that particular well, and we wanted to determine whether it was part of a larger problem, or if it was just in that one little area. So, three wells were installed. One upgradient and two downgradient of that well. No TCE was detected in any of these wells, so we concluded that it was a small area, it was not a larger problem. The temporary wells were located here, here, and here. MW04 is right there.

MR. RAINES: Where was the well site with -- or the

concrete pad with the AST?

MS. HANNA: The AST, I think, was located, around here.

MR. RAINES: Okay.

MR. SWARTZENBERG: So, it was probably related to the storage tank that had dry cleaning fluid in it.

MR. HUMPHRIES: Question. Did any of these contaminants get in the aquifer?

MS. HANNA: These were all in the shallow aquifer. All these wells were - there were a couple of intermediate wells, but the only contaminant -- Oh, MW04, where that contaminant was found, is a shallow well, which is -- I'd have to look up the depth, but it was not in the drinking water aquifer. The Castle Hayne is -- Rich, could you answer how deep the Castle Hayne aquifer is?

MR. BONELLI: In this area of the base, it's probably down around 60 to 70 feet down.

MS. HANNA: Yeah. This well is less than 30 feet for sure, and the contamination was not within the Castle Hayne aquifer.

MR. HUMPHRIES: My second question. You mentioned a large plume and a small plume. An acre, half-acre, or what?

MS. HANNA: That was in the original study. I don't have an acreage. I don't know.

MR. BONELLI: That was done during the UST study years ago. They just identified them, I think, as a north and south plume. I don't think they actually got into the acreage, if I remember right.

MS. HANNA: They didn't give acreage. Conclusions for this site -- we are recommending no action because the PCE was no longer detected, and TCE was in a very small area. The other contaminants that were identified as COPCs were not site related. A ROD will be prepared based on this no action that will be taking into account public comments and CERCLA process will be concluded for this site. I guess this site may go back into the UST Program, but I'm not sure. Rick, could you comment on that? Do you know if these sites are going back into the UST Program?

MR. RAINES: I see we're going to determine that tomorrow, but they will be all relevant and applicable requirements -- regulations that the USTs are subject to. So, we meet all the requirements that the UST Program sets out to meet, too. Did that answer the question?

MS. HANNA: It did for me.

MR. SWARTZENBERG: What about the TCE that's still in the ground water there? You're just going to forget about it, right?

MR. RAINES: We've shown that it's deteriorating, haven't we?

MS. HANNA: Yes.

MR. RAINES: It's naturally deteriorating. It's going from PCE to TCE, and it's in one well. We're showing that it's breaking down, and we have every reason to believe that it will continue to break down until it goes away.

MS. TOWNSEND: I think, to add to that, it has taken us about four years to really close out the site. And because it was

only a minor problem for the IR Program, being that the TCE was just a little incidental hit as compared to the UST site, we're thinking that this is one case where the UST contamination helped our natural attenuation process; what we're trying to improve in other parts of the base, and that we've seen the degradation and plus, I don't have the exact concentration, but the TCE that is remaining out there are very low levels. We're talking -- what was it, 17?

MS. HANNA: It's lower than that.

MR. RAINES: It's 2.

MS. TOWNSEND: It's 2? It started out 17, and now it's 2, and it's less than the standards for remediation. So this is one program where a contaminant may have helped another contaminant, and it's remediated itself.

MR. SWARTZENBERG: Okay, I just didn't pick that up.

MS. HANNA: The next site is Site 91, also UST sites. And this one had one 300-gallon tank. There also happened to be four ASTs removed that contained waste oil, antifreeze, and kerosene, and it's basically an industrial land use setting. Here are some photographs. You can see a concrete cover, only tiny grass patch areas here amongst buildings. There is an open area there, but it's used for -- is this the Engineering School area? Site 91?

MR. BONELLI: I believe so.

MS. HANNA: But it's pretty much industrial use. And here is a drawing of the site and the former ASTs were here. The

former UST basin was approximately here. As with Site 90, a three well site check was done which found oil and grease in the soil, and toluene in the ground water. Because there were contaminants detected, they did a leaking underground storage tank assessment, and again found two areas of contamination, which included the chlorinated hydrocarbons again. So, that kicked it into the IR Program. They also found chlorinated hydrocarbons in the subsurface soil, so it went into the IR Program. And we did a focused RI, did subsurface soil sampling and ground water sampling. Again, we found common laboratory contaminants and inorganics in the subsurface soil at -- the inorganics at levels similar to naturally occurring levels. In the ground water, there were more laboratory contaminant type things that we did not consider site related. These are the subsurface soil sample locations during the RI, and the groundwater sample locations. And a qualitative risk assessment was done at this site, based on the post-RI results, using the same screening criteria as for Site 90. For subsurface soil, one inorganic was identified as a COPC.

MR. SWARTZENBERG: What is a COPC?

MS. HANNA: Contaminant of potential concern. Because it exceeded the screening criteria that is established by EPA or the State. In ground water, these contaminants were identified as COPCs, and many of them weren't considered site related at all. In fact, none of these.

MR. SWARTZENBERG: Well, if they're not site related, what are they?

MS. HANNA: Well, the inorganics are naturally occurring. Chloroform here is considered a common laboratory contaminant. And when we looked at the concentrations -- the detections at the site, they were within -- there is a USEPA rule of thumb. When your concentration is less than 10 times your blank sample -- because we collect quality control samples -- if it's less than 10 times the concentration found in that sample, then you can't count it as being site related.

MR. SWARTZENBERG: Well, how could it be a contaminant of concern if it's not site related? It sounds like double talk.

MS. HANNA: The contaminant of potential concern -- what happened during the qualitative risk assessment was you take all the data and we screened it against the screening criteria which were not site specific; they are criteria that are established by EPA or the State, depending -- well, they both establish criteria. It may exceed one or the other. You often have different numbers. We took all the results, screened them, and then after that, we took a look at the QAQC -- some samples, and the naturally occurring levels of inorganics, and also looked at our concentration and compared it against those after the COPCs were identified. That was the second step. So, we took the entire list of contaminants, identified COPCs, and took only the COPCs that were identified, and then looked at those concentrations and compared it against the QAQC or naturally occurring levels. So, it was like a two-step process.

MR. RAINES: If I can add something to that. Jim,

remember when we went to -- we did the field trip and we did the sampling tests out at the well?

MR. SWARTZENBERG: Yes.

MR. RAINES: And they showed you how they brought out their own water and how in between sampling events they had to decontaminate the equipment and all that kind of stuff? They take a trip blank, use a sample of the water they take out to the site. They just return with that water, plus they -- but, during these processes, these contaminants can enter into -- say, they rinse off their probe and they don't get all the chloroform off. That's going to show up in the next sampling round. So, some of these things are introduced through --

MR. SWARTZENBERG: I guess it's just the way you're presenting it. You call it a contaminant of concern; what's the "p" for?

MS. HANNA: Potential.

MR. SWARTZENBERG: Then you say, well, it's not a big deal, because it's chlorinated. How can it be both?

MR. RAINES: Anything that pings high is a potential contaminant. And then we try and find out how they -- is it site related, or was it introduced during sampling?

MR. SWARTZENBERT: Okay.

MS. TOWNSEND: One thing that you keep in mind, the process is designed so you do not eliminate contamination before you evaluate it. Because that way, you can come up with a lot of false positives or false negatives. So what you do is you identify

and pyrene was detected -- there was one well in October at low levels and it was never detected again. So, because of the follow-up studies and analysis, we believe that -- well, we recommend no action, because we don't believe them to be site contaminants or site related. So, we've recommended no action. CERCLA process will be completed at the signing of the ROD, when we take into account public participation and comments, and the same thing for this site with the UST Program, as Site 91. Any questions on Site 91? Any other questions?

We'll move on to Site 92. There was one 1000-gallon tank removed in 1994. During the removal, they found elevated levels of petroleum hydrocarbons and here is a photograph. There is a pier; boats are there. It's somewhat of a recreational area; there is a picnic area. Here is the site. This is the Courthouse Bay here. Here is the pier, and there is the approximate location of the former UST. Because it was a UST, they did the three well site check. There was nothing found in the soil, but they found PCE in ground water and because of that it went into the IR Program, and they did a Focused Remedial Investigation on it. They studied subsurface soil and ground water and found inorganics, acetone, which is considered a common laboratory contaminant, and the same with the bis(2(ethylhexyl)phthalate and also, I believe, one detection of that pesticide in subsurface soil. Chloroform and inorganics were found in ground water. Here are the subsurface soil locations from the RI and ground water locations. The Qualitative Risk Assessment was done at this site as well. These

contaminants were found to be -- when screened were identified as contaminants of potential concern. Inorganics were within background. The acetone and chloroform, we believe, because they were below the 10 times rule, were considered laboratory or decontamination procedures. Because we found these lab contaminants, we wanted to verify that and also the inorganic levels, so we did some post-RI monitoring. No VOCs or SVOCs were ever detected during the course of sampling. There were four rounds of sampling at this site. We did them on a quarterly basis. The inorganics were found but, again, these we considered to be -- they were within naturally occurring levels and we don't believe they were site related. So, based on these results, all these studies, over a course of time, we recommend no action. That would conclude the CERCLA process when the ROD is signed, and again, they may go back into the UST Program to address that -- close it out under that program.

MR. SWARTZENBERG: That tank was just gasoline.

MS. HANNA: Yes, it was just gasoline.

MR. SWARTZENBERG: Would any of that gasoline have MTBE in it?

MS. HANNA: None was detected.

MR. SWARTZENBERG : They did check for it.

MS. HANNA: Rich, do you know if they sampled for that?

MR. BONELLI: It's typically a requirement to look for that, but I don't know if their methods covered that. Sometimes they do, sometimes they don't.

MR. SWARTZENBERG: Do you know whether this tank was leaking?

MR. BURTON: I don't think the UST investigation found significant petroleum contamination. There wasn't any in the soils, the manganese, with respect to the ground water.

MR. RAINES: There were very little POLs. It was the chlorinateds that drove it to further investigation. It wasn't the POLs. Did not appear to be a release.

MR. SWARTZENBERG: I'd just be curious to know if they even bothered checking for MTBE. It wasn't a big deal until about a year ago.

MR. RAINES: Well, this is fairly old, too. This might have been before they even started adding MTBE.

MR. SWARTZENBERG: Well, that's my comment. You can do what you want with it.

MS. HANNA: I guess that's it. Any other questions on these three sites?

MR. BONELLI : I'd like to thank everybody for coming this evening for our presentations. If you have any questions, feel free to contact me, and we'll turn things back over to Rick and have him close our presentation for this evening.

MR. RAINES: Once again, we do have copies of the PRAPs up here. Be sure that everybody gets a copy of these. For your comments, I guess we will handle them informally. Mr. Swartzenberg, we'll get back to you with an answer on the MTBE. Want to make sure you signed in, so we'll have your name, and if

there are no more questions -- does anyone have any more questions?

MR. HUMPHRIES: I have one. How is the money situation for the cleanup?

MR. RAINES: That's a pretty broad question, but Kirk here is from LANTDIV, and they handle basically the money that funds the CERCLA program down here.

MR. HUMPHRIES: We're getting our share, right?

MR. RAINES: Yeah.

MR. KIRK: We are. It doesn't really deal with the (inaudible) action, but Camp Lejeune, in the Atlantic division that we handle, is the largest customer that we service, and their program this year was around six and a half million dollars, which would be again next fiscal year the same amount. We can talk in more detail right after the meeting to answer specific questions.

MR. HUMPHRIES: Always worried about money.

MR. RAINES: We do get our share and we -- as one of the larger installations, I don't know if we get first cut off the top, but basically they're continuing funding our program. Anything else? We want to thank y'all for coming out. Hopefully, you learned something, and --

MR. BONELLI: Don't hesitate to call us with your questions.

The meeting was concluded at 8:05 p.m.

